HYDROPHOBIA IN DOGS AND OTHER ANIMALS,

AND THE SANITARY PRECAUTIONS AGAINST ITS TRANSMISSION TO THE HUMAN RACE.

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Sir—The subject of hydrophobia has been recently attracting more than ordinary attention, not only here, but also throughout France and England, particularly the latter country, in the north of which canine madness has for several years been prevailing to an alarming extent. On account of its undue frequency there has been provoked considerable discussion as to the character of rabies, and during February last a number of communications upon the subject appeared in the London *Lancet*. In this correspondence the Hon. Grantley F. Berkeley, the well-known sportsman, maintains the remarkable theory that there are *two distinct forms of rabies canina*—one hydrophobia, pure and simple, characterized by a *dread of water, and communicable by inoculation*—another attributable solely to *distemper, not marked* by any *fear of water, and incapable of transmission.* The first form, viz., *genuine hydrophobia*, he considers so extremely rare as to be *scarcely ever observed.* These singular views are warmly endorsed by Dr. E. P. Philpots, whose confidence in their truth is so strong that he expresses his anxious desire to be bitten by some so-called rabid animal. Considering the dangerous influence of such positive opinions upon the ignorant and credulous, it might almost be hoped that for the sake of humanity, as well as of science, the doctor's wish should be speedily gratified.*

* A melancholy instance of the fatal results of the same incredulity has lately been witnessed in the death by hydrophobia on June 17, 1874, of Mr. Francis Butler, long prominent in this city as a canine veterinarian and dealer in the rarer breeds of dogs. Mr. Butler was an accomplished gentleman, a linguist, and author of several excellent treatises relating to dogs. He was devoted to a profession in which his innate fondness for the canine race had induced him to engage. Some six weeks previous to his death he was severly bitten in the thumb while administering medicine to a Spitz with suspicious symptoms; but confident in his peculiar opinion —one similar to that of Sir G. Berkeley—he neglected the proper precautions, and soon after fell a victim at his home in Brooklyn to the deadly invasion of the rabific virus.

The principal opposition to the views of these gentlemen has come from Mr. George Fleming, Veterinary Surgeon to the Royal Engineers, a scientific man, and author of a recent work* upon hydrophobia. Mr. Fleming's remarks are somewhat caustic, but so utterly destructive of the absurd doctrine enunciated by Sir Grantley Berkeley that the latter excuses himself from replying to them, on the ground of presumed personalities.†

In New York City, during March and April of the present year, four persons perished from hydrophobia, and new interest in the subject was thereby awakened. Although in 1873 no cases of the disease were reported, its human victims within the four preceding years had amounted to no less than twenty-one. During the twenty years ending with 1874, its mortality in this city has been as follows: In 1855 there occurred four deaths; in 1856, three deaths; in 1857, two deaths; in 1858, no deaths; in 1859, two deaths; in 1860, no deaths; in 1861, five deaths; in 1862, one death; in 1863, three deaths; in 1864, one death; in 1865, three deaths; in 1866, two deaths; in 1867, four deaths; in 1868, one death; in 1869, five deaths; in 1870, three deaths; in 1871, seven deaths; in 1872, six deaths; in 1873, no deaths; in 1874, five deaths.

Many physicians of long practice have never had an opportunity of meeting with this affection in either man or other creatures; and although most medical men are more or less acquainted with its symptoms in the human subject, as delineated in the text-books, its history and many interesting facts in connection with its occurrence among the lower animals, are not generally familiar to the profession. It is believed that a better acquaintance with such facts and a knowledge of the most practicable and effectual measures for our own protection against the disease, in cities more especially, are of sufficient

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* This work is entitled "Rabies and Hydrophobia—their history, nature, causes, symptoms, and prevention." It is a very complete treatise upon the subject and has afforded me much material for the present report.

† The existence of hydrophobia *sui generis*, as produced by a specific virus, was denied by Bosquillon toward the close of the last century, and the same idea has been more recently adopted by Maschka and Lorinser. As late as the last century no fewer than seven varieties of hydrophobia were accepted by some writers. Of the seven only two were regarded as incurable. Linnæus divided the disease into two distinct genera—viz., rabies and hydrophobia. The former he thus defined: "*Desiderium mordendi lacerandique innocuos*"; and the latter, "*Aversatio potulentorum cum rigore et sardiasi*," adding "*sæpius præcedenti maritæta*." In the fourth century, Oribasius of Pergamus, physician to Julian the Apostate, in writing on hydrophobia, regarded it as generally fatal; but he spoke also of a curable form of the disease due to other causes than the bite of an animal. The absurd opinion that hydrophobia may originate from the bite of a healthy dog is unworthy of discussion by scientific men of the present day (see foot note, page 756).

importance to sanitary science to be embodied in a special report, which I have now the honor to present.

Hydrophobia is a remarkable disease, to which both the human species, and probably all of the brute creation, are subject. In examining its history we find that the Hebrew writers are altogether silent with regard to it, and we can discover only rare allusions to it among other authors previous to the Christian era. Such references, however, are sufficient to indicate that, although it may not have been so prevalent among the nations of antiquity as among those of more modern periods, yet it was in very ancient times recognized as a peculiar disorder infesting certain animals, and even man himself.

The earliest distinct mention of the disease occurs in a Hindoo medical work of great antiquity, dating probably as far back as nine or ten centuries before Christ, written by a renowned physician named Susruta.* It is observed therein that when dogs, jackals, foxes, wolves, bears, or tigers become rabid, they foam at the mouth, which remains open, and from which flows saliva; their tails hang down; they do not hear or see well; they snap at and bite one another, and thus communicate the same malady. The symptoms of hydrophobia in human beings who have been bitten are likewise detailed briefly, and are said to terminate in convulsions and death. Scarification of the wound and burning it with boiling *ghee*—a sort of oil made from butter—are recommended, as well as various antidotes to be subsequently administered. This concise and remarkably accurate description of the affection, with suggestions for treatment, may be regarded as an epitome of all ancient and modern research upon the subject.

Homer is supposed by some authors, though without much reason, in my opinion, to allude to hydrophobia in the Iliad, where Hector is compared to a raging dog. There are two passages in Hippocrates which appear to indicate that the physician of Cos had observed its characteristic symptoms in man, but failed to regard it otherwise than as a variety of idiopathic phrenitis. His cotemporary, Democritus (the laughing philosopher), however, who was a famous traveler, had probably encountered the disease in foreign parts, as he was evidently well acquainted with its most striking peculiarities. We are informed by the distinguished Roman

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* See Wise's History of Medicine.

physician Cœlius Aurelianus, that Democritus, in a treatise upon Opisthotonos, had described the affection in the human subject, admitting its origin from the bite of rabid animals, but considering it simply as a form of tetanus.

Theocritus and Plato refer to rabies among wolves. Aristotle, in his History of Animals, remarks that dogs are afflicted with madness, quinsy, and gout; that the first renders them furious and inclined to bite other animals, who thereupon also become rabid; and that all animals *except man* are liable to be seized with and destroyed by the malady so engendered. The physicians Artemidorus, Gaius, and Asclepiades also mention the disease, and it is alluded to by Zenophon and Epicharmus.

In the early portions of the Christian era references to the affection by physicians, poets, and other writers become more frequent. M. Artorius, the friend and medical attendant of Augustus, speaks of it, in a treatise upon the subject, as being situated in the stomach. Gratius Faliscus, a poet of the same period, describes rabies in a work entitled the Cynegeticon. Virgil, in his Georgics, classes rabies among the distempers of cattle and sheep, induced by a pestilential condition of the atmosphere. Ovid speaks of a rabid she-wolf and rabid centaurs, and Pliny of the bite of a mad dog. Horace employs the expression rabies canis, in a figurative sense, applying it to the fierce heat of the dog-star. The disease is mentioned by Columella, a writer on husbandry, in the first century, who alludes to an opinion common among shepherds that a dog may be ensured against rabies by biting off the last bone of its tail on the fortieth day after birth. This is still a popular superstition among dog-fanciers in some countries. Suetonius refers to wild animals affected with madness. Eumedes, a physician in the reign of Tiberius, makes some interesting observations upon the disease, remarking that even the shedding of tears will excite spasms in an affected person. Dioscorides, in the time of Nero, appears to be the first who claims to have actually treated the disease. Both he and Galen describe it as attacking animals and men, and agree in the opinion of its communicability from the former to the latter by contact of the morbid saliva with the second skin. But Galen and Celsus as well concern themselves rather with the prevention and treatment of hydrophobia than with its history and progress. Their cotemporary, Magnus of Ephesus, locates the affection in the stomach and diaphragm. According to Plutarch, it was not until the time of

Pompey the Great that the rabific poison first began to manifest itself among human beings. Andreas of Caryste, a physician of the Alexandrian school, has left a work upon the disease, which he terms *Κυνολυσσος*. Cœlius Aurelianus, already mentioned, a distinguished physician of the reign of Trajan or Adrian, or perhaps as late as the fifth century, is the first to furnish an accurate detailed description of the affection in man, and of the various controversies regarding it. He mentions it as being endemic among animals in Caria and Crete. About the same period the affection is treated of by a number of other medical men. Ætius, a Mesopotamian doctor of the sixth century, is the first to furnish anything like an accurate description of rabies in dogs. A century later the physician Paulus Ægineta gives another excellent account of hydrophobia.

Among the Arabian physicians Yahia-Ebn-Serapion, Rhazes Africanus, and Avicenna mention the disease, the last terming it simply "*canis rabidi morsus.*"

Since the time of Paulus Ægineta we find the affection described by numerous European writers.

Fleming recounts the following curious story of a case of rabies in a bear, recorded about the year 900. At that time immense forests covered Burgundy, Maconnais, Brescia, and part of Lyonnais, which were infested with wolves, wild boars, bears, and other ferocious animals. One day a bear, following the course of the river Saone, at last arrived at the quay at Lyons. Everybody fled except some boatmen, who, armed with heavy sticks, attempted to kill it. The bear, little intimidated by their number, rushed among them, and bit about twenty. Six of these persons were shortly afterwards smothered in consequence of fearful madness. The other fourteen, however, had thrown themselves into the river to escape the animal's attack, and, it is affirmed, were thus preserved from the effects of the poison by its being washed out of their wounds.

In 1026 an outbreak of rabies among dogs in Wales is mentioned in the laws of Howel the Good. From that time it appears to have been well known in England, numerous specific remedies, charms, and incantations against it being recommended in old Anglo-Saxon manuscripts still extant.

One of the earliest reports of scientific interest refers to wolves afflicted with hydrophobia in Franconia, Germany, in 1271. More than thirty shepherds and peasants fell victims to their attacks. In 1500 Spain suffered from the ravages of canine madness. In 1532 a rabid

dog is said to have strangled the Cardinal Crescence, the Legate of the Pope, at the Council of Trent. According to Forster there was an epizoöty of rabies among dogs at the same time with the epidemic plague in Flanders, Turkey, Hungary, and Austria in 1586. Bauhin informs us that in 1590 it appeared in an epizoötic form among the wolves of Monthelliard, and in 1604 it was wide-spread in Paris. In 1691 dogs in great numbers became mad throughout Italy, and in 1708 it was epizoötic among dogs in Suabia. Fleming states that in 1712 wild beasts of all kinds perished in large numbers at Somogy, Hungary, and in the woods the country people found dogs which had been driven there by madness. Men bitten by them were quickly seized with frenzy and hydrophobia. From 1719 to 1721 severe outbreaks of the disease took place in France and Germany, and in 1722 and '23 it prevailed in Silesia, invading Hungary, and it visited other portions of Europe in 1725 and 1726. Dogs, wolves, and wild animals generally were affected, particularly in Silesia and Lusatia. The disease, according to Huxham, prevailed in England in 1734–5. Hughes, in his History of Barbadoes, narrates that in 1741 many dogs went mad in those islands. The county of Fife, Scotland, was infested with mad dogs in 1748. In 1752 numerous mad dogs were reported about St. James, London, and orders were issued to shoot all that appeared. According to Layard, London again suffered from the disease between 1759 and 1762. In 1763 it broke out among dogs in Italy, France, and Spain, and in many places all dogs were slaughtered. In Madrid 900 were killed in a single day. Rabies was alarmingly frequent among dogs and foxes in Boston and its neighborhood in 1768, '70, and '71, when it was there regarded as a novel disease. Lipscomb says that the disease was very general in England in 1774. From 1776 to '78 it reigned almost continually in the French West Indies, the true disease never having been observed there before. In 1779 it was very common among dogs in the city of Philadelphia and in Maryland, and in the same year it affected wolves in Belluno, Italy, and about Bourges, France. In 1783 it made its advent in the islands of Jamaica and Hispaniola as a very serious epizoötic.* In 1785–6–9 canine madness

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* At that time canine madness became so general in the latter island that its government ordered the extermination of the whole canine race. This order was so effectually carried out that the surface of the water in the harbor of Port au Prince was literally covered with the bodies of slaughtered dogs.—(*Gentleman's Magazine*, Feb., 1784.)

was extremely prevalent throughout the United States. In 1788 it raged in England. From 1785 to '89 various portions of Europe were afflicted, the country people being terrified by numerous rabid wolves. In the latter year the disease was particularly prevalent in Munster, Westphalia. In 1797 it was epizoötic in Rhode Island, U. S.

About the commencement of the present century it was noticed that foxes began to suffer frequently from rabies. In 1803 these animals were running mad in large numbers through the Pays de Vaud, and in the Aubonne, Orbe, Cossenay, and Yserden districts at the foot of the Jura. In 1804 similar outbreaks of vulpine madness occurred on the northern shore of the Lake of Constance, and thence extended through Germany. This epizoöty continued more or less till 1837, attacking the foxes of Wurtemberg, Baden, Bavaria, the upper Danube, the Black Forest, Forest of Thuringia, Jena, the Voralberg, Upper and Lower Hesse, Hanover, Hohenzollern, Rottenberg, and Ulm. At this period badgers were also observed to be affected. We are informed by Blaine that in 1806 rabies in the dog so abounded in the neighborhood of London that scarcely a day passed without his being consulted about one or more cases, and sometimes he attended three, four, or five a day for weeks together. From that period until 1823 it prevailed every year in London and its suburbs.

The most memorable period in the records of hydrophobia was between the years 1803 and 1830, when it appeared to an unheard of degree in many portions of both Europe and America. In the summers of 1803 and 1804, during the presence of excessive heat, and after long-continued warm weather, it broke out upon the northern coast of Peru. It is described as it prevailed in that country by Prof. Unanue, Proto-Medico. His account, though somewhat highly colored, is, nevertheless, extremely interesting. He informs us that the disease became general among quadrupeds, attacking them indiscriminately, but fixing itself especially upon dogs. The dogs exhibited the ordinary appearances of the affection. The cats ran about with hair erect. The horses and asses were arrayed against each other. The cattle leaped furiously, and engaged in hostile encounters. The disease, engendered, as the professor believed, by atmospheric conditions, was subsequently propagated by specific contagion, spreading into the interior of the country. It proved fatal

to many of the inhabitants of Arequipa and Ica, carrying off forty-two persons in the latter town alone. In one instance twelve fell victims out of fourteen bitten by a single dog. The largest number of deaths occurred in from twelve to ninety days after the bite. The affection would, therefore, appear to have been of a more virulent character than usual. It is likewise related that a number of slaves upon a sugar plantation contracted the disease by feeding upon the beef of rabid cattle, a statement which we can hardly accept as true.*

About this same period hydrophobia was noticed to be remarkably prevalent in many portions of the United States, where the medical literature of the time abounded with accounts of cases and discussions as to the character and treatment of the disease.

In 1810 Southern Russia was scourged by the affection. In Prussia, between 1810 and 1819, its human victims amounted to 1,635, a large number of whom owed their deaths to the attacks of rabid wolves. In 1813 the disease was very common in the Ukraine. In 1815 it prevailed in Austria, and at the same time, according to Viborg, it raged in Copenhagen. In Podolia, in 1818, Marochetti, a celebrated Russian physician, attended no fewer than 26 cases of hydrophobia in the human subject, and shortly afterward announced to the medical world his so-called discovery of *Lyssi*, which created a great sensation. According to his description the hydrophobic virus, after the bite of a rabid animal, is transported to and deposited in the orifices of the secretory ducts of the sublingual glands, beside the frenum linguæ and upon the lateral parts of the inferior surface of the tongue, where form a number of vesicles or pustules of variable size, in which by means of a probe fluctuation can be detected. It cannot be determined precisely when these pustules appear—ordinarily between the third and ninth days after the bite—sometimes the twentieth day, or even later. If the poison in these pustules be not destroyed by cauterization during the first twenty-four hours of their appearance, it will be removed from them by resorption, producing metastasis to the brain and nervous system, with resulting hydrophobia. Thus, according to Marochetti, the virus does not remain in the wound where it was originally deposited, but is quickly conveyed in all its integrity to the sublingual glands. According to this physician

* Gohier alone mentions similar instances. He states that he has seen hydrophobia in dogs result from eating the flesh of a rabid dog in one instance, and of a rabid sheep in another. But a large number of experiments by Hertwig would seem to prove the innocuousness of such food.

similar appearances are to be found in rabid dogs and other animals. In 1822, Magistel, a French doctor, was said to have confirmed the existence of these pustules in several cases coming under his observation; but notwithstanding the treatment recommended and applied, five out of ten persons bitten by one dog were seized with the malady and died; and, in a word, the theory was soon exploded. The truth is, as Watson observes, that the mucous follicles of the mouth, and those at the base of and particularly beneath the tongue, are commonly exaggerated in both men and dogs laboring under the disease—and these enlarged follicles were regarded by Marochetti and Magistel as a specific eruption furnishing the virus and pabulum of this complaint.

In 1819 rabies prevailed in Canada, whose Governor-General, the Duke of Richmond, fell a victim to it, having been bitten by a captive fox. In 1820, as Blaine informs us, rabies canina was again rife in England, and continued alarmingly prevalent for a number of years. In 1822 it was common in Holland. In 1819 and 1829 Italy suffered from the disease; and Brera mentions the circumstance of a wolf's having communicated it to nine persons out of thirteen whom it had bitten. The period between 1819 and '27 is particularly noticed by Wirth as remarkable for the prevalence of rabies among the foxes of Switzerland and Germany, and those animals infected large numbers of dogs, cats, horned cattle, horses, pigs, goats, and sheep. Notwithstanding their natural shyness, the mad foxes boldly faced and followed men and animals in order to attack them. In 1824, throughout many districts of Russia and extending thence into Sweden and Norway, the disease prevailed extensively among foxes, wolves, dogs, cats, and reindeer. In 1828 its human victims in England and Wales amounted to twenty-eight. In 1829, according to the Veterinary Professor Prinz, it was very destructive in Dresden. From 1823 to 1829, as Hertwig informs us, it was unusually common in Berlin, and, as Böhme states, in Saxony also.

In 1830 the subject of hydrophobia had so alarmed the public mind in England that the House of Commons thought fit to appoint a select committee to investigate it. Evidence was furnished by many eminent physicians, surgeons, and veterinarians, among whom may be mentioned Sir Benj. Brodie, Mr. Benj. Travers, Mr. Morgan of Guy's Hospital, Mr. Earle of St. Bartholomew's, Prof. Coleman, and Mr. Wm. Youatt. Mr. Earle presented positive proof of the undue

prevalence and increase of the disease in England during his time, remarking that he had witnessed twenty-five cases in the human subject within as many years, whereas his father had seen but one in fifty years of previous practice. Mr. Youatt testified that he had recently applied lunar caustic successfully to some four hundred bitten persons, and a surgeon of St. George's affirmed that he had within a limited period similarly treated four thousand without an accident.

During the second quarter of the present century, as compared with the first, there ensued a decided abatement of the disease in England, owing to the creation of the dog-tax and the enactment of other laws calculated to decrease the number of worthless curs.

In Vienna, in 1830, there were reported in rapid succession thirty-nine cases of rabies in the dog. It then almost disappeared until 1838, when one hundred and seventeen cases occurred. In 1839 there were reported 63 cases; 317 in 1840, and 141 in 1841. Of the last, only fifteen were bitches. The largest number of cases were noticed in February and May—twenty-one respectively—and the fewest in September, November, and December. Between 1830 and 1847 there were 1,038 human victims to hydrophobia in Austria. In 1831 and '32 canine rabies was wide-spread in the Duchy of Posen. In 1833 it existed to an alarming extent in Barbadoes. In 1834–5 it prevailed in Saxony, Pomerania, and Switzerland. In 1835 it was frequent in Chili, South America. In 1836 it was seriously prevalent in Paris, and from 1839 to '42, according to Prof. Rémy, the disease was epizoötic among the foxes of Wurtemberg, and was by them communicated to many dogs, and a large number of the latter animals were thus affected in Baden. Between 1840 and 1842 the malady appeared in various departments of France, being particularly destructive in Lyons and its vicinity. In May, 1844, great numbers of mad dogs were seen in Roscommon, Ireland. In the same year it made its first appearance in Malta, and became very serious. In 1851 and 1852 there was a terrible epizoötic of canine rabies in northern Germany. In 1852, in the small town of Adalia, Turkish provinces, a mad wolf bit 128 persons and a great number of cattle. In 1858 hydrophobia became so destructive in Algeria that the Governor-General was compelled to issue a circular relative to preventive measures. From 1855 to 1860 the disease was common in England, in Northern Germany, in France, and in Spain. In 1860 it prevailed very extensively among dogs, and was very destructive to cattle in Ohio and

Missouri, U. S. Between 1860 and 1862 numerous cases of hydrophobia communicated from dogs to natives occurred in China at Tietsien, near Pekin, and at Canton, while about the same period the presence of rabies was more than usually noted in Vienna and Rhenish Prussia.

According to Sir Samuel Baker the disease was epizoötic in Abyssinia in 1862. In Bavaria, between 1863 and 1867, there was a yearly average of 800 cases of hydrophobia in a total of 275,000 dogs. From 1863 to 1867 it was very prevalent in Saxony also, where in the three last years of that period there were reported 764 cases of canine madness. It created much alarm in Lancashire, England, in 1864. In 1864–5 the city of Lyons was thrown into great excitement on account of the terrible frequency of this redoubtable disease. In 1865 it was unusually common in the vicinity of London, and during the next year it assumed formidable dimensions in England. In 1866 it was epizoötic in Athens, Greece. In 1867 the English dogs at Shanghai, China, were seriously affected, and a number of persons were bitten, with fatal results. In 1868 many mad dogs were seen in Belgium, a country usually exempt from the affection. In 1869 the disease was rife in Paris. In 1870 canine rabies created great terror in the north of England, and it has prevailed very constantly in that country up to the present time.* In 1871 hydrophobia was remarkably fatal in Barbadoes. Oertle reports a severe epizoötic of the disease among foxes in Carinthia from 1866 to 1872. According to the last United States census for the year ending June 1st, 1870, there had occurred in the State of Louisiana alone 22 deaths from hydrophobia, in a total for the whole country of 63.† Of the remainder the States of New York and Pennsylvania each furnished 9.

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* Fleming remarks that "the wide and serious extension of this epizoöty over the country appears to have been largely if not altogether due to the insufficiency of the police measures adopted in the different towns and districts, the late period at which they were introduced, the want of a proper and uniform sanitary organization to combat the spread of this and other contagious diseases of animals, and the general ignorance prevailing with regard to its symptoms and nature."

† The mortality of hydrophobia in the human subject, like that of other communicable diseases, varies very considerably in different countries at various periods. In France, between 1854 and 1860, the number of deaths were computed by the Minister of Public Works at 1,000. In Prussia, from 1810 to 1819, there were 1,635 deaths, and 1,073 from 1820 to 1834. In Bavaria, between 1839 and 1847, the mortality was 39. The Austrian Empire suffered severely during the period from 1830 to 1847, when 1,038 persons succumbed to hydrophobia. In Sweden the mean annual death-rate at four different periods of the disease was: 58 from 1778 to 1785, 138 from 1786 to 1790, 6 from 1831 to 1835, and 42 from 1856 to 1860. In Belgium, between 1856 and 1860, there were 26 deaths. In Algeria, from 1844 to 1863, there were recorded 47 deaths—34 Europeans, 7 natives, 6 nationality unknown. The deaths in England in 1849 amounted to 17, in 1850 to 13, in 1851 to 25, in 1852 to 15,

Although the manifestations of hydrophobia are clearly modified by character, habit, and temperament in various species and varieties of animals and even in individuals, it is undoubtedly the same disease in all, whatever its peculiar form or mode of origin or propagation. It is almost universally conceded that the introduction of a specific virus into the system through either an actual wound, an abraded surface or a delicate mucous membrane is an essential preliminary to the development of this affection in man. But its origin among brutes has always been and still is a subject of much discussion, and one worthy of our most serious consideration. Hydrophobia certainly infests and by many is regarded as capable of originating *de novo* among certain *carnivora*, viz., the dog, wolf, fox, jackal, cat, skunk, and raccoon, while other creatures, including man, contract it by inoculation alone.

Of the various conditions asserted as favoring its development in the canine race few have even a probable foundation. One is alleged to be the state of repressed sexual desire, the λυττα ἐροτικη of the Greeks. Others are extremes of atmospheric temperature, excitement of anger, want of water,* and insufficient or putrid food. Ziegler fixes the origin of the disease in lack of the instinctive amount of nourishment from blood and flesh, and hence designates it *blutdurst* and *fleischgier*.† Still another presumed influence is the presence under the dog's tongue of a worm-like appendage, whose existence is believed to encourage the production of hydrophobia, and whose extirpation in puppyhood is considered an infallible preventive of the disease. This peculiar appendage was alluded to as a cause of madness by the poet, Gratius Faliscus, already mentioned, and the miraculous properties ascribed to it may doubtless be referred to a very ancient myth.

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in 1853 to 11, in 1854 to 16, in 1855 to 14, in 1856 to 5, in 1857 to 3, in 1858 to 2, in 1859 to 4, in 1860 to 3, in 1861 to 4, in 1862 to 1, in 1863 to 4, in 1864 to 12, in 1865 to 19, in 1866 to 36, in 1867 to 10, in 1868 to 7, in 1869 to 18, in 1870 to 32, in 1871 to 56, in 1872 to 39, and in 1873 to 28. In Scotland, between 1855 and 1863, only 12 persons died from hydrophobia, and none in the succeeding three years. According to the national census there occurred in the United States during the year ending June 1st, 1860, a mortality from hydrophobia of 38. In New York City, from 1855 to 1874, inclusive, there were 57 deaths; none having been registered in 1858, 1860, or 1873.

* In Venice, according to Mosely, on account of the opinion that the disease is occasioned by thirst, all barbers, shoemakers, and coffee-house keepers are obliged to have a small vessel of water before their doors that the dogs running about the streets may drink what they want, as there are no other places in that city where they can obtain fresh water.

† According to Ménécier poor feeding retards the outbreak of the disease in an inoculated animal, while hearty feeding accelerates it.

Pliny called it *lyssa*, and asserted that when removed from the dog, carried thrice around a fire, and administered to persons bitten by a rabid animal, it possessed the virtue of a specific against hydrophobia. In an Anglo-Saxon leech-book of the 11th century, a similar recommendation is made, as follows: "Take the worms (thymas) which be under a mad hound's tongue (under thede hundes cunzan), snip them away, lead them round about a fig tree, give them to him who hath been rent; he will soon be whole." Allusion is made to it in a work entitled the Kynosophion, supposed by some to have been written by Phæmon, while others attribute it to Demetrius Pepagomenos, a Greek writer who lived at Constantinople in the 12th century. In this work it is stated that there is underneath the dog's tongue a little body like a white worm which must be quickly destroyed ere it increase and invade the whole throat. In the 16th century Fracastorius, in a poem styled "*Alcon sive de cura canum venaticorum*," refers to it in the following words: "*Vulnificus vermis suffunditque ora veneno.*" In more modern times the Germans generally believed in it, terming it the *toll-wurm*, or *worm of madness*. So popular was the superstition at one time that in the middle of the last century there existed in Prussia an ordinance requiring all owners of dogs to submit them to this mutilation. The ordinance was rendered more specific by a royal decree of February 20, 1767, establishing an authorized corps of operators whose duty consisted in visiting semi-annually all houses containing dogs, removing the worm from every animal, and furnishing the master thereof with a certificate to that effect. The edict prescribed likewise that each dog should be so treated before it had become six months old, and persons violating the law were condemned to pay a fine of fifty Prussian crowns, or in default thereof to suffer an imprisonment of one month. In 1786 a similar law prevailed in Hanover. This so-called worm was explained by some to be a vein whose absence in a dog menaced by hydrophobia leads to engorgement of the throat and immediate asphyxia. It was regarded by Morgagni and Heydecker after careful examination as a spiral tendinous arrangement peculiar to the canine race, having some connection with the genio-hyo-glossus muscle, and serving to facilitate the act of lapping. Other authorities, however, deemed it to be the duct of the submaxillary gland, and others still maintained that it was merely the *frenum linguæ*. The English author Fothergill, in his celebrated treatise upon hydrophobia,

remarked that nothing was definitely established relative to the utility of the operation, but that the whitish vermiform substance thus removed was, it might be presumed, nothing else than the canal attached to the salivary apparatus, whose destruction might exercise some influence upon the secretion in diminishing the liquid transmitting the virus. The tradition never obtained much credence among the English. Dr. Johnson spoke of the reputed worm very expressively as "a substance—nobody knows what—extracted—nobody knows why." The whole theory was, however, substantially demolished in 1786, in the very country where it was most in vogue, by the communication of hydrophobia to both men and animals from dogs whose toll-wurms had been extirpated in the most approved manner. These facts were substantiated by the investigations of several sanitary commissions at Trieglitz in the province of Detmold, and the corps of operators was finally abolished.

According to a report of Dr. Armand to the Paris Academy of Sciences, the same tradition and practice still continue in Thrace, and they are described by Auzias Turenne in the *Receuil de Médecine* for 1869 as being general in Turkey and Moldo-Wallachia. Dr. Xanthos says that in modern Greece they still remain as a memorial of the past. Fleming states that they prevail in Roumania, and Ramon de Sagra observes that they are common in portions of Spain. A similar superstition exists even in our own country, especially in the South.

The other presumed causes of spontaneous rabies would appear to be equally equivocal. Unsatisfied salacity,* putrid food, hunger,† thirst, anger, and extremes of temperature are manifestly circumstances which obtain among dogs quite generally throughout the world. In some regions, so far as can be learned, hydrophobia has always been either totally unknown or extremely rare, while in others exempt from

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* But few writers now maintain the theory that the disproportion between the sexes in the canine race and consequent difficulty of sexual gratification for many males produces hydrophobia. Statistics show that the number of cases is about divided in proportion to the number of each sex, and that castrated dogs are as liable to the disease as others. Of two hundred and sixty-seven cases observed by Schrader in Hamburg, in 1852-3, there occurred two hundred and fifty-six in male dogs, ten in bitches, and one in a castrated animal. Of fifty-four pronounced cases observed by Tscherning in Denmark, from 1854 to 1857, there were found four male and three female dogs that had been castrated—thirteen per cent. Bourrel treated in eight years three hundred and forty-four rabid males and forty-nine rabid females.

† Attempts to produce hydrophobia artificially by starving dogs have been ineffectually made by Radi and Bourgelat. The same negative results were obtained by Ménécier who did not see a single instance of hydrophobia among one hundred and sixty dogs thus treated. Pilwax observed during one of the severer epizoötics in Vienna that the greater number of affected dogs belonged to owners in good circumstances, enjoying therefore for the most part proper attention as to care and food.

it for ages it has only recently appeared, and in most instances can be traced positively to importation.

Although in England it has long prevailed extensively, it has always been uncommon in Scotland. Dr. Kane states that in the portion of Greenland visited by him in 1854, the affection does not exist, although it is closely simulated by a variety of endemic epilepsy with tetanoid symptoms.* We are not aware of its ever having been seen among the Esquimaux of Labrador. Odheliues, writing in 1777, declares that up to that time no account of any case of hydrophobia had ever been communicated to the Swedish scientific associations; but from 1778 to 1790 it carried off nearly 1,200 human victims in that country, and as we have seen, it spread from Russia into Sweden and Norway in 1824. Erman, in describing the Ostyaks of northern Siberia and their dog-sledges, notices that the affection is a stranger to that region, and quotes Steller as mentioning the same fact with regard to the dogs of Kamschatka. Dr. Livingston observes that he never heard of more than a single case in South Africa, and was by no means satisfied as to its being genuine hydrophobia. According to the travelers Clark and Du Chaillu the disease is unknown upon the gold coast and in the western portion of Africa. It seems to be equally absent from the east coast of that continent, but in North Africa it is well recognized. During the early portion of the French occupation of Algeria the malady appeared to be so unfrequent as to lead some writers to suppose that it had previously had no existence in that country. But in 1860 the Medical Society of Algiers, after a careful investigation of the subject, came to the conclusion that the Arabs had been acquainted with the disease from a remote period. It is acknowledged, however, that among the native tribes rabies is extremely rare in comparison with its prevalence in the centers of civilization—*places peopled chiefly by Europeans.*

The famous Volney observes: "Among the singularities which appear most extraordinary to a stranger at Cairo may be mentioned the great number of ugly dogs which roam about the streets. The Mussulmans do not kill them, though considering them as unclean, but often throw them fragments from their tables; and devotees even endow charitable foundations of bread and water for the dogs. These

* Subsequent to the period of Kane's visit, hydrophobia became epizoötic in Upernavick, the northernmost settlement in Greenland (in Feb., 1860), and proved fatal to all dogs attacked (Hering Jahresbericht über Thierheilkunde—1860). According to Leisering it prevailed in the same place in 1863.

animals have also the recourse of the common sewers, all of which, however, does not prevent them from suffering by hunger and thirst; but it is very astonishing that these extremities never occasion madness." The same fact had been previously alluded to by Prosper Alpinus, physician to the Venetian Consulate at Cairo; and it was noticed also by Larrey with regard to the whole of Egypt previous to the French invasion. Since that period, however, according to Drs. Pruner, Amstein, and Punel, it has not been uncommon in those regions. Dr. Burguières-Bey, Sanitary Physician at Cairo in 1857, mentions a number of instances of rabies in dogs derived from animals imported from other parts. In 1862 Sir Samuel Baker, while exploring the Nile tributaries of Abyssinia, recorded the existence of rabies in that portion of Africa. According to Burton the disease is known, though very rare, in El Hejaz, a part of Arabia adjacent to the Red Sea. It was unknown in the Mauritius until introduced in 1821 by a dog from Bengal. In India it was rare until the importation of foreign dogs, but it is now frequently observed there in both animals and men. In Hong Kong, in 1857, a bloodhound imported from England became rabid and bit several people, of whom one died. It was remarked that no case had ever before occurred on that island. Dr. Morehead has found it recently in Bombay, bearing the same ratio to the population as in England, and no less fatal.* The disease is well known to be rare in many Turkish cities which swarm with vagrant dogs acting as scavengers and constantly engaged in combat. The same is true of Lisbon, and, indeed, according to Dr. Souza, the disease is similarly unfrequent throughout Portugal. We are told by Schrader that in 1852, when hydrophobia was causing great ravages along both banks of the Elbe, the islands of that river were entirely free from it. During that memorable epizoötic there were reported in the city of Hamburg alone two hundred and sixty-seven mad dogs. Mosely affirms the disease to be a stranger to the island of Antigua, and Savory pronounces it to be unknown in the island of Cyprus. Rabies was never noticed in Malta until its introduction from abroad, in 1847. Marsden, in his History of Sumatra, regards that island as exempt from the disease. According to Hamilton, the writer on hydrophobia, no rabid animal was ever seen in Madeira, where dogs abound and are

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* According to the Hon. Mountstuart Elphinstone, in Afghanistan it affects wolves, jackals, and dogs, and is attributed to the simoon or pestilential wind.

afflicted with every other canine disorder. Fleming states that the most careful inquiries fail to show that the disease has ever been witnessed in either Australia, New Zealand, St. Helena or the Azores. Darwin says that it has never appeared in Van Dieman's Land. John Hunter relates that previous to 1783 no case of hydrophobia had ever been known in the Island of Jamaica, where it was there introduced by an affected dog from America. M. Desportes, a practitioner in Hayti from 1732 to 1748, never heard of the disease in that island. M. Liguistin, Veterinary Surgeon-in-Chief of Bazaine's French expedition to Mexico, states in the Journal de Médecine Vétérinaire Militaire for 1867, that rabies was observed frequently in Mexico at that time, *but was almost exclusively confined to dogs imported with the army.** It was first seen in La Plata, South America, in 1806, *having been introduced by English sporting dogs.* According to the account already referred to, given by Prof. Unanue, Proto-medico in Peru during the early portion of the present century, there had existed no record of canine madness in any part of South America previous to 1803, when it became widespread among dogs and other quadrupeds in Peru, assuming the form of an epidemic. It is true that the professor, in his relation of this invasion of epizoötic disease, endeavors to account for it by spontaneity of origin due to long and uninterrupted hot weather, but with very insufficient proof. Like other diseases, both epizoötic and human, communicated only by contagion or actual contact, hydrophobia, as its history well shows, *is liable to assume an epidemic character*, or, as the expression is, "*to rage*" in certain localities, *under conditions ill understood, after it has spread by the intercourse of travel.* Its geographical study affords the most cogent arguments against the doctrine of its spontaneous origin.†

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* I am informed by a friend who, previous to our war with Mexico, took up his residence at San Antonio, Texas, where he remained twelve years, that he never heard of an instance of hydrophobia in that region, although it contained large numbers of hunting-dogs. He himself kept a hunting pack. It was related to him, however, that in 1846 a ranchero near Monterey, Mexico, while sleeping at night in front of his house, was bitten in the finger by a coyote (prairie-wolf), which snapped at him and immediately made off. The wounded man lost no time in chopping off his finger, as it was believed by the natives that wolves acting in that manner were rabid.

† "When hydrophobia prevails as an epizoötic—a phenomenon that is often quoted in support of its spontaneous origin—there can almost always be detected upon careful examination one or more central points which serve as distinct depôts or centers of infection. We know, moreover, that the spread of the epizoötic is arrested by the larger rivers. Furthermore, the mere epizoötic and enzoötic appearance of hydrophobia indicates in itself nothing more than the existence of a primary genetic cause; whereas, we know on the other hand that the infectious diseases themselves appear almost invariably in the epidemic and endemic form."—(Otto Bollinger, in Ziemssen's Cyclopædia.)

Another circumstance strongly bearing against this theory is the immunity from rabies experienced by dogs in isolated places. Thus a number of islands have been mentioned as enjoying entire exemption from the disease until its actual importation by infected animals; and it is related that Mr. Meynell, the most eminent English sportsman of the last century, preserved his kennel of hounds from hydrophobia during many years by forcing every new dog to undergo a rigid quarantine of several months preparatory to his admission into the pack. A similar system, could it be universally adopted, would doubtless ultimately result in the extinction of rabies; but at present it is practicable only to a limited extent.*

In regard to season, it has been well demonstrated that whatever influence the weather may exert upon the character or duration of the disease, it has little, if any, power in its production. Rabies prevails indifferently in all seasons. The popular notion that it is most common in summer would seem to have been founded upon the authority of the ancient writers, Dioscorides, Paul Ægineta, Ætius and others, but in reality this opinion is of the greatest antiquity, appearing to have some connection with the *Κυναφοντις ἑυρτη*, a festival of the Argives, during which large numbers of dogs were slain.

So long ago as 1780, Andry observed that January, the coldest, and August, the hottest months, furnished the least number of cases of rabies which he was able to collect; and at a later period, M. Trolliet, after laborious investigation, asserted that in France the disease was most frequent among dogs in May and September, and among wolves in March and April; and that the fewest cases among dogs occurred, as Andry had stated, in the months of extreme temperature—January and August. There has already been noticed an outbreak of rabies among the dogs of Vienna in 1841, when the largest number of cases were observed in February and May, and the fewest in September, November, and December. In Algeria the disease is most prevalent among dogs in the autumn and winter. The distinguished veterinarian, Professor Bouley, in a communication to the French Academy of Sciences, April 4, 1870, gives the results of an analysis of departmental reports in France for the six years, 1863 to 1868, which

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* Schmidt (Zoölog. Klinik, I., p. 362) observes that in the case of wild beasts kept in close confinement for years, hydrophobia is never seen to arise.

exhibit for the spring, 89 cases; summer, 74; autumn, 64; and winter, 75. Professor Röll of the Vienna Veterinary Institute has found the disease more prevalent in mild than in hot summers. Faber, in his Wurtemberg statistics, shows rabies to be there most frequent in March, February, June, and January, and least so in September, October, and August.

Table of Cases of Canine Rabies by Months and Seasons.

	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Total.
Bourrel	123	109	115	123	112	120	100	114	122	105	94	102	1,339
Vienna Veterinary School	..	..	4	1	..	2	1	4	9	10	2	..	33
Pasta	6	4	6	11	16	15	18	8	9	9	7	4	113
Veterinarian	3	..	1	..	..	..	1	1	..	..	6	3	15
Blatchford	11	10	13	6	12	8	8	5	12	6	8	2	101
New York City*	3	1	4	5	5	1	1	2	1	3	3	2	31
Total	146	124	143	146	145	146	129	134	153	133	120	113	1,632

	Spring.	Summer.	Autumn.	Winter.	Total.
	March, April, May.	June, July, August.	September, October, November.	December, January, February.	
Statistics given above	434	409	406	383	1,632
Paris*	77	74	81	81	313
Lyons*	147	121	96	96	460
Toulouse	16	2	11	4	33
Radcliffe	30	15	14	23	82
Total	704	621	608	587	2,520

The table above set forth is entirely conclusive upon this point, embodying, as it does, the immense number of 2,520 distinct and authentic cases of rabies canina observed in France, Austria, England, and the United States. I have derived these statistics from the following sources: 1,339 cases from figures supplied by M. Bourrel,

* The figures of Paris and Lyons were kindly supplied me by Professor A. F. Liautard of the New York College of Veterinary Surgeons. Those of New York City have been derived from notes of Coroners' inquests.

Director of the Paris Dog Infirmary (1859 to 1872); from those of Lyons, 460; from various Paris practitioners, 313; from a report in 1865, by Dr. Pasta, upon canine rabies in Milan, Italy, 113; from a report (1856) on the subject by Dr. Blatchford to the American Medical Association, 101, being cases occurring in this country; 82 from Radcliffe's English statistics; 33 from the statistics of the Veterinary School at Toulouse, France (1843 to 1858); 33 from those of the Vienna Veterinary School in 1862; 31 from the statistics of New York City (1856 to 1874); and 15 from the British periodical, the *Veterinarian* for 1870.

The foregoing facts and figures demonstrate the absurdity of repressive laws designed to be in operation only in summer.

As to the influence of hunger and thirst in generating hydrophobia, Dupuytren, Breschet, and Magendie famished a great number of dogs and cats without the production of anything at all resembling rabies; and a similar result attended some cruel but decisive experiments conducted at the Alfort Veterinary School.

We must, therefore, acknowledge our ignorance of any causes concerned in the spontaneous development of this disorder, supposing such an event possible. Prof. St. Cyr, of the Lyons Veterinary School, who has devoted many years to an attentive study of the malady, and whose experience has been immense, does not hesitate to assert that cold, heat, drought, and humidity—in a word, all the meteorological conditions, whatever they may be, are absolutely without any perceptible influence as causes of rabies. *Its reproduction solely by inoculation from one animal to another* is, therefore, the only satisfactory theory left us, and is one, moreover, amply sufficient, as is universally admitted, to account for the vast majority of cases, and in all probability such mode of transmission is responsible for every case.* The most plausible objection to this opinion lies in the suggestion that the disease *must at one time have sprung from a beginning*, which argument, however, when used with regard to *any* contagious disease, can only remove us from the sphere of susceptible proof back to the mysterious and impenetrable domain of original causes.

As I have observed, certain carnivora are particularly prone to hydrophobia, and it has been maintained by many authors that such

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* An instance of congenital hydrophobia is related by Callinac (Matton, Donat. Considérations sur la Rage, Strasbourg, 1862). A cow, while suffering from rabies, gave birth to a calf, which was soon likewise seized with the disease, although given another cow to suckle.

animals not only develop the affection, *but are the only ones capable of communicating it.* Many well attested facts, however, may be adduced to refute this doctrine. It seems probable that most animals liable to contract the disease are also in a greater or less degree competent, under favorable circumstances, to transmit it, such a mode of propagation being entirely consistent with the general laws of contagion. We do not know of any animal exempt from hydrophobia. As I have mentioned, the ancient Hindoo physician Susruta enumerated dogs, jackals, foxes, wolves, bears, and tigers as among its victims, and this statement has been substantiated in modern times. Cats are well known to be frequently rabid. Aristotle alludes to the camel as suffering from the affection. Aurelianus mentions the dog, leopard, bear, horse, ass, game-cock, and man as subject to the disease and able to propagate it. Boerhaave affirms that the disease has been communicated to others by dogs, cats, wolves, foxes, horses, asses, mules, swine, apes, chicken-cocks, cows, and men. Van Swieten relates an instance of hydrophobia occasioned by the wound from an enraged cock's beak. Hufeland gives a case of a man's contracting the disease from the bite of a badger. In 1824, as I have noticed, many reindeer were seized with rabies in Sweden and Norway, and the disease is frequently observed among deer, and sometimes buffaloes. In the *Veterinarian* for 1864 a case is recorded of a Mr. John Goggin, a Limerick confectioner, dying of hydrophobia from the bite of a pet monkey. In the Boston Medical and Surgical Journal for 1859 appears a case reported by Dr. A. De Jernett, at Greenville, Texas, of a girl bitten by a pole-cat January 8, 1857, in whom hydrophobia manifested itself on February 21, following. This case is analogous to a peculiar form of the disease in skunks, to be presently described. Dr. Blatchford's Report to the American Medical Association contains an instance of hydrophobia in a man resulting from the bite of a raccoon.* Roucher relates that in Algeria a dog has contracted rabies from the bite of a ferret. In 1841 Prof. Eckel, of Vienna, succeeded in conveying the disease from a goat to a sheep ; he likewise successfully inoculated the dog with the saliva of rabid herbivora, as did also the

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* A curious link between the last-mentioned animal and the dog exists in a brute peculiar to Japan and Eastern Asia. It is so rare that even the British Museum contains no example of it. A specimen, however, has recently been received at the Zoölogical Society's Gardens, Regent's Park, London, having been captured in one of the Russian settlements on the Amoor. In its essential structure it is closely allied to the dog, but its external appearance is more like that of the raccoon. On account of its nocturnal habits, this singular species has been termed "*Nycterentes.*"

French Prof. Renault, of Alfort. Berndt, of Greeswald, inoculated four sheep with the saliva of a mad ox, and they all became rabid. Breschet asserted that he had conveyed the disease to other animals by inoculation with foam from the mouths of rabid horses and asses. Prof. Rey, of the Lyons Veterinary School, caused rabid sheep to bite healthy sheep, who in turn became mad. He also caused madness in an ass by inoculation from a rabid ram. Prof. Tombari, of Turin, reports that at the Veterinary School of that city a horse, a sheep, and two bitches were made hydrophobic by inoculation with the saliva of a rabid heifer. Bourrel, in 1847, inoculated a sheep successfully with matter from a rabid steer. Lessona, in 1852, inoculated two horses and a sheep from a rabid ox. Tardieu mentions that in 1855, in the department of Creuse, France, a shepherd was bitten by a rabid sheep, and soon afterward died of hydrophobia. Youatt cites a case related by Dr. Capella, where a mad rabbit bit a lady and horse, both of whom perished from hydrophobia. Youatt likewise gives well authenticated cases where horses communicated the disease to men and dogs, and one where a dog was inoculated by an ox. Pilwax, in 1868, inoculated a dog with the saliva of a rabid horse. Mr. King, of Bath, England, produced the disease in a hen by means of the virus from a cow, and a similar communication of the disease from an ox to a fowl was effected by Dr. Ashburner, of England. Delafond, in his *Police Sanitaire*, reports a case of direct inoculation from a cow to a man. Fleming, in his *Animal Plagues*, relates a similar case as happening in New York State in 1789. In the Boston Medical and Surgical Journal for 1858 it is related that at Norwich, Conn., while a girl was giving water to a hydrophobic cow, a scratch upon her hand was inoculated with froth from the animal's mouth, producing hydrophobia shortly afterwards. Watson cites instances of horses having been inoculated by eating the straw upon which rabid pigs had died. Prof. Simonds, as we find in the *Veterinarian* for 1839, caused two rabbits to become mad with the saliva of a rabid sheep. It is certainly true that ruminating and herbivorous animals, owing to the formation of their jaws and teeth, as well as to their seldom attempting to bite when rabid, rarely communicate the disease, and hence the belief entertained for some time by such eminent men as Astley Cooper and the veterinary professors Coleman and Renault, that the power to transmit the disease was confined to such animals as naturally employ their teeth for weapons of offence.

Roucher gives an instance of canine rabies in Algeria produced by the bite of a ratel or ferret. Dr. W. Lauder Lindsay, in the British and Foreign Medico-Chirurgical Review for January, 1874, mentions elephants, guinea-pigs, and rats as having been known to suffer from the complaint. He also alludes to a case of hydrophobia communicated from a rat to a man. It is altogether probable that rats not unfrequently contract the disease from dogs or cats, propagate it among themselves, and in turn transmit it to their natural enemies and to other creatures. In this way we can reasonably account for those instances where dogs or cats have become rabid notwithstanding supposed isolation from sources of infection. Bollinger, among various animals subject to the disease, mentions martens, guinea pigs, and antelopes. Finally I may allude to a case recorded in 1793 by Penada, an Italian physician, where a human being was seized with hydrophobia after being bitten by an *insect*. This case need not seem apocryphal when we remember that malignant pustules have been occasioned by stings of flies which must have acted as vehicles for the contaminating element.*

In the American Journal of Science and Arts for May, 1874, appears an interesting article by Horace C. Hovey, of Kansas City, Mo., entitled *Rabies Mephitica*. The author applies this term to a peculiar affection closely resembling hydrophobia, resulting from bites inflicted by different varieties of the *Mephitis*, or skunk. He has obtained particulars of 41 cases occurring in Virginia, Michigan, Illinois, Kansas, Missouri, Colorado, and Texas, *all of which, save one, proved fatal.* He relates two instances also of dogs which perished from the same cause. The history of these cases is curious. The animals usually approach stealthily at night, their characteristic effluvium being suppressed, and inflict the deadly wound on some minor member, as the finger, ear, or nose. In five cases described, rather vaguely, the disease declared itself in from ten to twenty-one days after the injury, a period somewhat long for tetanus and somewhat brief for hydrophobia. In another instance, however, the virus asserted itself after an incubation of five months, and the victim died in terrible paroxysms.

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* Bollinger remarks (Ziemssen's Cyclopædia) that certain parasites, as fleas and lice, which are nourished by the dog, may transfer the poison to human beings and other animals by means of their blood-drawing apparatus. Flies unquestionably convey small-pox, and a case of vaccination by the medium of a flea was reported in the London Lancet, June 22, 1872.

The most interesting question in connection with this subject is in reference to the communicability of the affection by the human species. Cælius Aurelianus relates an instance of a seamstress who became infected by ripping with her teeth the cloak of a hydrophobic patient. Palmarius states that a peasant having the disease, communicated it to some of his children by kissing them. Tardieu relates a case of transmission from a shepherd to a sheep. Eckel produced rabies in a dog by inoculation from a locksmith who had hydrophobia. Two French physicians, Enaux and Chaussier, mention cases where persons have become infected by wiping their lips with napkins previously used by hydrophobic patients. In 1830, Mr. Earl, a prominent London surgeon, while administering medicine to a woman who was suffering from the disease, chanced to be bitten by her, and at once proceeded to cauterize the part. On being taunted with unnecessary timidity, he immediately inoculated a number of rabbits with the woman's saliva, and produced in several of them hydrophobic symptoms and death, while a similar result did not follow inoculation with the normal secretion. The celebrated experiment made by Magendie and Breschet, at the Hotel Dieu, in Paris, in 1813, was no less remarkable. They inoculated two healthy dogs with saliva from a patient named Surlu, who died of hydrophobia a few hours afterwards. One of the animals escaped; the other, carefully secluded, became rabid in six weeks, and having been made to bite several dogs, they soon went mad and infected others still. Hertwig also is said to have successfully transplanted the virus from a man to a dog, and Busnout, Berndt, Löffler, and Renault of Alfort, likewise have demonstrated that the disease is capable of transmission from mankind to the canine race.

Hydrophobia in the dog has been by some writers divided into two varieties, viz., *dumb* and *furious* rabies, according as the animal is sullen and undemonstrative, or noisy and fierce. Other authors recognize still a third variety, which they term *tranquil* rabies, where the animal is quiet, indifferent, and unaggressive. These distinctions, however, are by no means clear. Virchow denies altogether the existence of any distinct forms of the disease, considering them merely as prolonged conditions or stages, which, according to him, are—1st. The *prodromic* stage, or that of *melancholy;* 2d. The *irritable* and *furious* stage; 3d. The *paralytic* stage.

It is occasionally very difficult to detect the existence of rabies in

its nascent state. This accounts for cases of hydrophobia in persons inoculated by dogs supposed not to have been rabid, and which died or were killed before the full development of the disease. Thamhayn has collated 19 cases occurring in the human subject in which dogs, to all appearances healthy, but which subsequently became rabid, produced hydrophobia by their bite. Fortunately, however, the disposition to bite is not apt to be exhibited until the affection is well established.

The disease is first manifested by constant restlessness, uneasiness, disinclination for human society, and irritability of temper—the animal of fondling and sociable disposition becoming snarly, morose, and shy. It is in this early stage that the pet dog especially is dangerous to his human associates, children particularly, who, instead of avoiding him, are liable to annoy him with caresses and attempts at conciliation, or to punish him for his unaccountable peevishness. He evinces a desire to hide from observation, retiring under pieces of furniture, into dark corners, or the interior of his kennel, but frequently changing his position from one place to another. He is continually engaged in licking, scratching, or rubbing some portion of his body. He is usually costive, and occasionally has nausea. His appetite becomes depraved, and he begins to search eagerly for and to swallow the most indigestible substances, as bits of thread, wool, hair, glass, straw, wood, and dung, and he even laps his own urine and eats his own excrement. These symptoms are almost infallible, and the presence of an incongruous mass of such materials in a dog's stomach after death is regarded by most authorities as entirely conclusive of the character of his disorder. Although he may have been naturally amiable, he now takes every opportunity of quarreling with his canine companions, but his strongest antipathy is exhibited against the cat, which he chases and worries whenever she appears. The animal's countenance undergoes a marked change ; that of the docile and affectionate dog assumes an earnest, inquiring, appealing expression ; that of the savage brute becomes the very picture of ferocity. In the early stages of rabies, the dog's attachment for his master appears greatly exaggerated, and he will constantly endeavor to lick his hands, his face, or any part he can reach. As Youatt has observed, females and men, too, are apt to allow their dogs, when in health, to indulge in this filthy and very dangerous habit, and the virus of a rabid animal may thus be readily deposited upon a wounded or abraded surface,

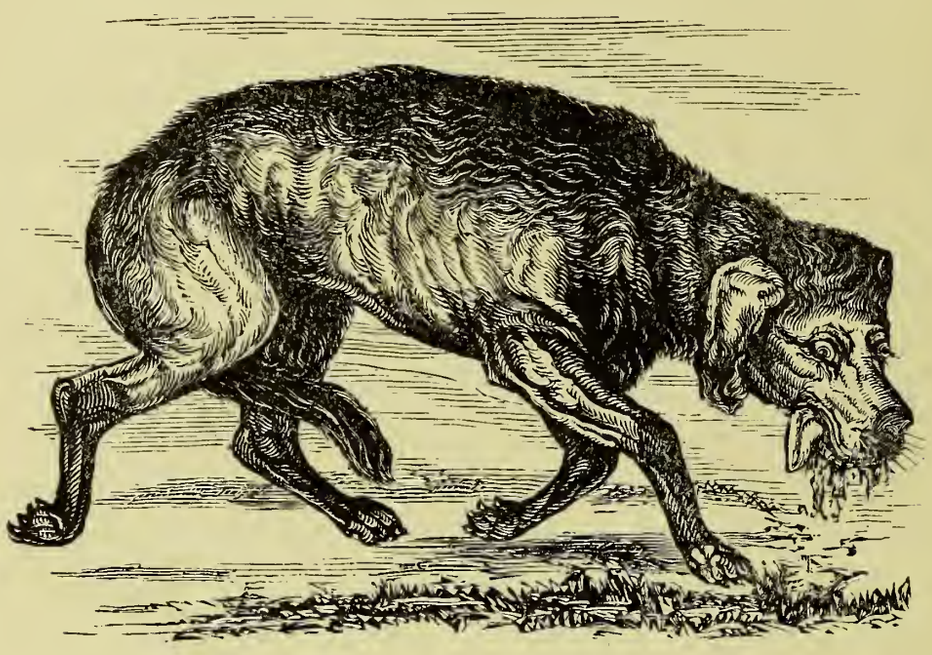
and be absorbed without exciting the suspicion of the victim. The dog, if unable to reach the hands of his master, will mumble his foot, or sometimes suddenly seize it in his teeth—then crouch and ask pardon. An early and very characteristic sign of rabies is a peculiar delirium—the animal snaps at imaginary objects floating in the air—*muscae volitantes*—but this hallucination is quickly dispelled by his master's call—he listens attentively for a moment, and then relapses into his mental wandering. About this period some degree of strabismus is common—not that *appearance* of squinting which in *distemper* is produced by the protrusion of the *haw* or *membrana nictitans*—but an *actual* distortion of the eyes, one of which is generally affected more than the other. Twitchings also may be observed about the eye, extending gradually over the cheek and face. Congestion of the conjunctiva likewise occurs. As a rule, before the disease has become well developed, the bark and voice of the animal undergo a remarkable change. His bark, which in health has usually little inflection, now ends abruptly and very singularly in a howl a fifth, sixth or eighth higher than at the commencement—the animal's nose being at the same time raised. Sometimes he will utter a hoarse inward bark, rising slightly in tone at the close. To one acquainted with these sounds, they indicate the disease, however equivocal may be the other signs. M. Bouley relates the following authentic anecdote to show the importance of recognizing this modified bark: Some years since two veterinary students, on their return to the Alfort School about 9 o'clock at night, heard the characteristic howl of a rabid dog proceeding from a house in Charenton. They felt impelled to knock at the door and warn the proprietor of the danger which menaced him; and he fortunately receiving the warning as seriously as it was given, kept the animal, a watch-dog, chained during the night, and the next day conducted it to Alfort. The students had not been deceived; for M. Bouley certified that the dog was mad, and its master could scarcely recover from his astonishment when so informed; he could not believe that the creature he held, still docile, affectionate, and obedient as ever, could be suffering from so redoubtable a disease. Such, nevertheless, was the fact—for undeniable symptoms of rabies soon manifested themselves.

In about a couple of days after the commencement of the disease, the animal often begins to lose control of his voluntary muscles. He snaps eagerly at his food, but frequently misses it, and if it is grasped

within his jaws, he either bolts it suddenly or drops it while endeavoring to chew it. This loss of power increases in the muscles of the jaw, tongue, and throat, until the lower jaw becomes dependent, and the tongue protrudes and assumes a livid color. Still, by a sort of convulsive effort, the dog is perfectly able to bite. Up to this time frothy spume or slaver has been constantly driveling over his lips; but now the saliva lessens in quantity and becomes thick, viscid, and glutinous, adhering to the fauces and corners of his mouth. He attempts frantically to detach it with his paws, and being consumed with a burning thirst, he seeks for water, trying assiduously but often ineffectually to lap it, and in his eagerness overturning the vessel containing it. He now becomes insensible to pain; however severely beaten, he utters no cry of distress. In this condition he has been known to seize and munch burning coals, or grasp a red-hot poker firmly in his jaws, or to mutilate himself, without apparent suffering. The animal is now restless, and has a strong propensity to escape from home, to which he will sometimes return after doing much mischief. He wanders savagely about, attacking imaginary objects and venting his fury upon the real ones which he encounters. This period of agitation is sometimes continuous, until paralysis supervenes; but it is more apt to occur in repeated paroxysms, in whose intervals the creature appears exhausted and feeble. He then often lapses into a condition of fitful somnolence, from which he awakes to renew his violence. If confined, he gives utterance to the peculiar bark and howl described. When at large, however, he gives forth no warning noise, but seems determined on a straightforward trot. Stonehenge, in his "British Rural Sports," remarks: "This desire to wander appears to me an instinctive attempt to get rid of the disease by muscular action, and if indulged in quietly, I am inclined to think there might be some chance of a recovery. The disease is evidently caused by some poison, and as in other cases poisons are got rid of by some extraordinary secretion, so I am led to believe that the wearing down of the muscular, and with it the nervous system, by long-continued fatigue, is the natural cure of the disease."

During his peregrinations the mad-dog, if interfered with in any way, and more especially if struck, will wreak his vengeance on the offender; but he seldom, as a rule, goes out of his way to do a mischief, and will often pass through crowds of people without injuring any one. Even if pursued and annoyed by cries and hootings, he

usually rather endeavors to escape from his assailants than turn upon them. This, however, is not invariably the case, as a naturally ferocious dog is apt to hunt out his prey diligently and perseveringly, sometimes attacking and wounding many people and animals in his fearful course. A mad dog will usually, as long as he retains the least memory of his former predilections, avoid attacking his master, and refrain from molesting female dogs. The latter fact in a great measure explains the circumstance that the proportion of bitches found rabid is much less than their relative number might be expected to furnish.



RABIES CANINA—LATTER STAGE.

The latter stages of rabies are thus graphically described by Fleming:

"The rabid dog does not continue its progress very long. Exhausted by fatigue, by the fits of madness excited in it by the objects it meets in its way, by hunger, thirst, and also, no doubt, as a consequence of the disease itself, its limbs soon become feeble. Then it slackens its rate of traveling and walks unsteadily; its drooping tail, its head inclined toward the ground, the mouth open, and the protruded tongue of a lead-blue color and covered with dust—all this gives the distressed creature a very striking and characteristic physiognomy. In this condition, however, it is much less to be dreaded than in its early fits of fury. If it is still bent on attacking, it is only when it meets with anything directly in its track that it seeks to satisfy

its rage; but it is no longer sufficiently excitable to change its direction or go out of its course to attack an animal or a man not immediately in its path. It is extremely probable, also, that its fast-failing vision and deadened scent prevent its being so easily impressed by surrounding objects as it previously was.

"As has been said, to each paroxysm, which is always of short duration, there succeeds a degree of exhaustion as great as the fits have been violent and often repeated. This compels the animal to stop; then it shelters itself in obscure places, frequently in the ditches by the roadside, and lies there in a somnolent state for perhaps hours. There is great danger, nevertheless, in disturbing the creature at this period; for, when roused from its torpor, it has sometimes strength enough left to inflict a bite. Many people, and particularly children, have perished from hydrophobia through having committed such an imprudent act as disturbing a rabid dog in this condition; indeed, this danger may have given rise to the old proverb to 'leave sleeping dogs alone.' This period, which we may term the second stage of the malady, is as variable as the first stage, but it rarely indeed exceeds from three to four days. The phenomena we have described insensibly merge into those of the third or last period, when symptoms of paralysis appear, which are promptly followed by death.

"When the disease approaches its termination, and during the remissions in the paroxysms, these symptoms of paralysis become manifest, especially in the hind limbs, which look as if they could not support the animal's weight, and cause it to stagger about; or the lower jaw becomes more or less drooping, leaving the dry mouth partially open.* Emaciation proceeds rapidly, and the paroxysms diminish in intensity; while the remissions become less marked. The physiognomy assumes a still more sinister and repulsive aspect; the hair is dull and standing on end; the flanks are drawn up; the eyes lose their lustre, and are buried in their orbits; the pupils are dilated, and the cornea dull and semi-opaque; and the strabismus so often present adds still more to the terrifying appearance of the poor creature. The voice is husky, if at all heard; the breathing is laborious and the pulse hurried and irregular. Gradually the paralysis

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* This paralysis of the muscles of the lower jaw is often noticed, as I have mentioned, quite early in the disease.

increases, and the hinder extremities are dragged as if the animal's back were broken, until at length it is general, and is then the prelude to death." The dog becomes comatose, and if permitted to die in peace, perishes, as a rule, from asphyxia.

The progress of canine rabies is always rapid, and its termination almost invariably fatal. Its duration rarely exceeds ten days, and in most instances death occurs in from four to six days after the appearance of the initial symptoms. It may take place at any period of the disease, but small and delicate animals are liable to die in the early stages, and not unfrequently before any unusual appearances attract attention. Persons may be inoculated by such creatures without any apprehensions being excited before the peculiar sensations which usher in hydrophobia are experienced.

With regard to the period of incubation in the dog and other animals nothing has been positively determined as to the length of the interval elapsing between the receipt of the injury and the appearance of the rabies. In the dog Lafosse's experience shows seven days as the shortest and one hundred and fifty-five days as the longest period. According to Röll it varies from three to ten weeks. Youatt states it as from seventeen days to seven months. Blaine affirms that the majority of cases occur between the third and seventh weeks. Some authorities have seen the disease developed within three days. Renault gives from five to one hundred and eighteen days—the majority, however, are between fifteen and fifty days. According to St. Cyr the interval varies between sixteen and one hundred and fifteen days. Haubner, in two hundred cases, noticed that the appearance of the disease within two months occurred in 83 per cent., within three months in 16 per cent., within four months in 1 per cent. He mentions one instance of eight months and another of fourteen months incubation.

In the cat the incubatory interval would seem to be very brief —ranging from two to four weeks.

In the pig, according to the *Traité des Maladies du Porc* of M. Bénion, it never exceeds eight days. But Haubner affirms that the period varies from nine days to several months, and Gervi has known it to extend to two years.

Peyronie states the minimum time in the horse as fifteen days, and Baudin gives the maximum as fourteen months.

In the bovine race, Haubner, from statistics of two hundred

and thirty-four cases, states that 10 per cent. occurred after three months, 8 per cent. after four months. His maximum is nine months.

For the sheep and goat Vatel gives an average of seventy-four days, and Röll of from two to four weeks.

The above are all of the lower animals in which opportunities for investigating the subject of rabific incubation have been afforded on a scale sufficiently large to yield scientific data.

We cannot speak with any greater certainty as to this period in the human species. When the rabific virus has been deposited within the body (usually by means of a wound from a mad animal, but sometimes by simple contact of the morbid saliva with an abrasion), no extraordinary appearances succeed about the point of reception, which seems to heal and cicatrize entirely in a natural manner—usually by "the first intention." At that point, however, the poison remains *perdu*, until at some uncertain period it steals forth stealthily upon its deadly errand.* Watson infers that it may be shut up in a nodule of lymph, or detained in temporary and precarious union with some of the tissues. The duration of this union is in man as in the lower animals extremely variable. According to Thamhayn's statistics † of two hundred and twenty cases of hydrophobia in the human subject, the period of incubation was as follows :

In 2 cases, 3 days.	In 27 cases, 5 weeks.	In 4 cases, 6 months.
" 2 " 4 "	" 37 " 6 "	" 3 " 7 "
" 2 " 9 "	" 16 " 7 "	" 1 " 8 "
" 3 " 10 "	" 8 " 8 "	" 1 " 9 "
" 1 " 11 "	" 11 " 9 "	" 2 " 10 "
" 1 " 12 "	" 7 " 10 "	" 1 " 11 "
" 1 " 15 "	" 5 " 11 "	" 3 " 12 "
" 2 " 17 "	" 6 " 12 "	" 1 " 15 "
" 2 " 18 "	" 12 " 13 "	" 2 " 18 "
" 4 " 19 "	" 3 " 14 "	" 1 " 24 "
" 4 " 20 "	" 4 " 15 "	" 1 " 26 "
" 9 " 21 "	" 7 " 16 "	" 1 after 4 years.
" 16 " 4 weeks.	" 6 " 5 months.	" 1 " 5½ "

According to Trousseau the disease generally shows itself in the

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*The action of the poison has been compared by Virchow to that of a ferment, fresh particles of which during their liberation from the seat of injury are being constantly conveyed into the blood, producing through the medium of the circulation the specific effect upon the nervous system.

† Schmid's Jahrbücher, 1859.

human subject in from one to three months after the bite. It is certain, however, that in some instances the poison may remain latent for a very long period, and it is possible that it may, in either man or other creatures, be deposited and continue dormant until natural death. A local disturbance of the cicatrix or some irritation from constitutional causes is probably instrumental in leading to its escape into the general system. The circumstances which more especially tend, it is believed, to hasten the development of the affection are—constitutional debility, previous ill-health, the fright experienced at the time of the injury, fear and anxiety entertained afterwards, venereal and other excesses, exposure to the direct rays of the sun, depressing passions and injury to the cicatrix. A vigorous constitution and absence of all apprehension and causes of mental depression or bodily exhaustion most likely prolong the period of latency, or successfully interfere with the escape of the poison, especially if the quantity deposited has been small. In a minor degree the same physiological and pathological laws apply to the lower animals. There is no doubt that some individuals are very susceptible of inoculation, while others appear to enjoy entire exemption from it. This fact has frequently been noticed in dogs. Figures of the Alfort, Lyons, and Berlin veterinary schools show respectively one-third, one-fifth, and one-eighth infected out of all dogs bitten by other rabid ones. Hertwig inoculated fifty-nine dogs, of which only fourteen became mad. He mentions a dog which resisted for three years repeated attempts at inducing rabies, although seven others inoculated at the same time and with the same saliva succumbed to the affection. As with dogs, so with mankind—for providentially many persons injured by rabid animals remain unaffected. We have one instance, recorded by Thacher, of a footman thrice bitten by dogs manifestly mad (as they infected other animals) who escaped, although refusing all precautionary measures.

Several authentic cases of very extended incubation in man are on record. One in Guy's Hospital, carefully investigated by Dr. Gull, occurred after five years, and Mr. Hale Thomson, in the first volume of the London *Lancet*, relates an instance of seven years latency, the last twenty-five months of which had been passed in solitary confinement. Dr. Bardsley cites an authentic case of a fatal termination twelve years after the infliction of the bite, the evidence being clear and satisfactory. We are not warranted in considering as ordinarily

safe a person who has been bitten and has used no preventive measures, until at least two years have elapsed.*

The phenomena of feline rabies are not, on account of the peculiar disposition and habits of the cat, so easily detected and observed as in the other domestic animals. There is reason to be suspicious when the animal becomes gloomy and restless, attacks without provocation, shows a tendency to bite, moves about without apparent cause, is disposed to keep aloof, has a great thirst, refuses food, or exhibits a depraved appetite. Such symptoms should always lead us to confine the creature at once in some place where it can do no mischief. When the disease reaches the furious stage, the original tiger-like character of the animal with all its ferocious instincts is thoroughly restored. There is nothing, says Bouley, more terrible than to see a mad cat in a cage. Its mouth is partly open and foamy —its back arched—its tail beating its flanks—its claws are so rigidly protruded as to cause it to walk with difficulty, and they penetrate and leave their imprint in the floor. When any one presents himself before it, it flies towards him at a single bound, as high as the cage will permit, as if to attack the person's face, for which portion of the body the mad creature, when unconfined, has a special predilection.

Mr. Youatt gives the following description of his encounter with a rabid cat: "A cat that had been the inhabitant of a nursery, and the playmate of the children, had all at once become sullen and ill-tempered. It had taken refuge in an upper room, and could not

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* The one communicable disease which in its mode of invasion of the system, and in its indefinite period of incubation, bears a peculiarly close analogy to hydrophobia is syphilis—the poison of all other affections dependent upon specific contagion seeming to have a well-defined period of latency. That of the syphilitic virus would appear to be as uncertain as that of the rabific poison. According to Diday, in 52 cases of syphilis (not subjected to treatment) the period of incubation ranged from 25 to 105 days; according to Basserau, the interval between the infecting coitus and the outbreak of syphilitic erythema in 107 cases in which no treatment had been administered, varied from 20 days to five months. Fournier, from an examination of 307 cases, gives an *average* of forty or fifty days. Ricord, as the result of his extensive experience, enunciates the law that when no specific treatment is employed, *six months* never pass without the appearance of general symptoms. Sigmund, of Vienna, in 293 reliable cases, gives a maximum of three months. Cazenave goes so far as to estimate the average interval between the moment of contagion and the development of syphilitic erythema as *two years*, and relates one instance of *ten years;* and Vidal approves this statement. Even Bumstead, who advocates the opinion of a definite period of incubation, makes the following statement: "The earliest symptoms of general syphilis (except in cases of hereditary origin and of transmission through the fœtal circulation) have been preceded by a chancre *probably within three and certainly within six months*, provided mercury has not been given." He also adds that the development of syphilis is hastened by those causes which tend to depress the vital powers. Such circumstances are, as has been remarked, well recognized as instrumental in setting free the latent rabific virus.

be coaxed from the corner in which it had crouched. It was nearly dark when I went. I saw the horrible glare of her eyes, but I could not see so much of her as I wished, and I said that I would call again in the morning. I found the patient on the following day precisely in the same situation, and in the same attitude, crouched up in a corner, and ready to spring. I was very much interested in the case, and as I wanted to study the countenance of this demon, for she looked like one, I was foolishly, inexcusably imprudent. I went on my hands and knees and brought my face nearly on a level with hers, and gazed on those glaring eyes and that horrible countenance until I seemed to feel the deathly influence of a spell stealing over me. I was not afraid, but every mental and bodily power was in a manner suspended. My countenance perhaps alarmed her, for she sprang on me, fastened herself on my face, and bit through both my lips. She then darted down stairs, and, I believe, was never seen again." An immediate and thorough cauterization with nitrate of silver saved Mr. Youatt from any unpleasant consequences.

Unlike the mad dog the rabid cat no longer retains its former affection for its master—which, in truth, under normal conditions seems to be only a selfish attachment. It will often wander from home and retire to some obscure loft, or out-of-the-way-place, where it is dangerous to molest it. It soon becomes haggard and emaciated—its voice sounds hoarse and sinister, and paralysis and death finally supervene.

It may be instructive to describe the peculiarities exhibited by other animals when laboring under this affection.

The wolf and fox, and, in fact, most wild carnivora, when rabid, become extremely audacious, taking to the fields and roads, entering towns, and without hesitation furiously attacking men, dogs, horses, herds, and flocks. Strange stories are related of the arts to which rabid wolves have recourse in order to accomplish their purpose. They are apt to steal upon their victims unawares, selecting human beings as their peculiar prey, but without attempting to kill and devour those whom they attack. They usually fly at the hands or face, and hence their wounds are much more frequently followed by inoculation than those of dogs who generally snap at the legs, and from whose teeth the rabid saliva is likely to be absorbed by the clothing. According to Niemeyer, of 145 persons bitten by rabid dogs in Wurtemberg, only 28 took the disease. John Hunter relates that 21 persons were bitten by the same dog, and but one con-

tracted hydrophobia; while, as we have seen, Brera mentions the circumstance of a single wolf having communicated the disease to 9 persons out of 13 whom it had bitten.* M. Renault, in a report to the Paris Academy of Medicine in 1852, presented statistics of 254 persons bitten by wolves, of whom 164, or nearly two-thirds, became mad. Hufeland observes that those provinces in which hydrophobia is most abundant are contiguous to forests containing wolves, in Russia, Poland, Germany, the Ardennes, etc.

As death approaches the mad wolf skulks away, and dies blind and powerless in some retired spot.

Martens and badgers when rabid, like foxes, lose their natural shyness, and become bold and ferocious.

In the mad pig the symptoms consist in a peculiar uneasiness, itching of the wound, unnatural squealing, and husky grunt, savageness with a disposition to bite, gaping, salivation, often depraved taste, and exaltation of the sensitive function of the skin, finally marasmus, paralysis, and death.

In the horse the disease commences with restlessness, biting at the seat of injury, frequent change of position, sudden starts as though frightened, irascibility, and great susceptibility to external influences. The ears are constantly in motion, as though listening to strange sounds, and the animal seems subject to hallucinations. The eye is very sensitive to light, the pupil dilated, and the gaze fixed. In stallions and mares the venereal desire is increased. As the disease progresses there are noticed cutaneous quiverings, soon followed by convulsions. Loss of appetite and difficulty in swallowing are common. Paroxysms of rage occur, excited particularly at sight of a dog, when the horse kicks and paws viciously, and bites so furiously at any object within its reach that it sometimes breaks its teeth or its jaws. It even bites its own body. Respiration is accelerated and the voice is hoarse and disagreeable. There is rarely much salivation. The animal rapidly becomes emaciated, and sinks. There ensues paralysis of the hind quarters, causing it to maintain the recumbent position. Convulsions and general paralysis are the final symptoms.

The early symptoms in the bovine species are lessened or

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* It is recounted in the *Dictionaire Encyclopédique des Sciences Médicales* that in the village of Ewanguliezenvic, Russia, a single mad wolf bit 35 men and 23 women, of whom 24 men and 15 women succumbed to the disease. Dr. Michel, of Salie, Turkey, relates that in 1852 a rabid wolf there bit 47 persons, of whom 45 died of hydrophobia.

depraved appetite, restlessness, excitability, tremblings, constant salivation, augmentation of sexual desire, difficulty in swallowing, manifestation of disagreeable sensations at the seat of the wound, and mental delusions. Paroxysms occur as in the horse, when the eyes are staring, brilliant, and congested, the mouth hot and foamy, the voice altered to a dull, hoarse sound; the animal is very excited, bellows frequently, agitates its jaws, paws and kicks, or falls down, rolls about, and endeavors to get away from its fastenings. It frequently exhibits a desire to attack; strikes at obstacles with such fury that its horns are often fractured, and its forehead dreadfully contused. Rumination and lactation are suspended. Great emaciation, paralysis of the posterior extremities, inability to stand, and profound coma finally terminate the animal's existence. There is seldom any disposition to bite.

In the sheep and goat the symptoms are almost identical, save that in the former the desire to bite is much more prominent than in the latter. Loss of appetite, cessation of rumination, itching of the wound, and unusual sexual excitement* are the initial phenomena. These are succeeded by agitation, modification of voice, with a sort of dull bleating at intervals, staring and congested eyes with dilated pupils, and very abundant nasal and salivary secretions. In the paroxysms the beast leaps, paws, grinds its teeth, and butts wickedly at any animal or object within its reach. The sheep almost always endeavors to bite people, animals, and utensils, and will even attack dogs with great fury. Emaciation, debility, paralysis, great discharge of nasal mucus, convulsions, and death complete the last stage.

Fowls manifest the disease by similar nervous excitability and restlessness. They seem to have hallucinations, and perform frenzied movements; seek shelter from the light; their voice becomes husky; they are often aggressive, employing their natural weapons, and even attempting to bite. Staggering, convulsions, and paralysis indicate the approach of death.

Deer when rabid foam at the mouth, worry one another like dogs, tearing off each others' hair and flesh, and, when confined, bite at whatever comes within their reach.

Observations at the veterinary schools of France and Germany

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* This same symptom noticed in various animals is frequently present in human beings affected with hydrophobia. Boerhaave remarked it in men (satyriasis), and it was mentioned by Galen. According to Trousseau, nymphomania has sometimes been witnessed in women suffering from the disease.

have shown that in animals the temperature from the commencement of the disease is elevated, and is coincident with the rapid waste of tissue. The few observations recorded in cases in human subjects exhibit the same phenomenon. In one of the Nottingham cases mentioned in the British Medical Journal for December, 1871, the temperature before dissolution had risen to 106.2°. Drs. Aug. Vielé, A. M. Hamilton, and myself were recently (June 25, 1874) invited to visit a Mr. McCormick who was suffering from hydrophobia. We saw him two hours before death. His temperature had unfortunately not previously been observed; but at that period we found it to have risen to 104.2°.

The urine in both animals and men undergoes a marked change. M. Gubler of the Beaujon Hospital has shown it to contain an excess of earthy phosphates and carbonates, with renal epithelium, and an abundance of albumen—reaction acid—sugar not unfrequently present.*

The autopsical appearances in hydrophobic animals are variable and non-distinctive. Bruckmüller, after the most careful post-mortem examinations of 375 rabid dogs during a period of twenty years, arrived at the conclusion that the evidence furnished by dissection is of no value in defining or distinguishing the affection, and is worthless as a foundation for any theory. In man,† moreover, the most careful

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* In l'Union Médicale, 1869, there is mentioned the autopsy of a person who had died from hydrophobia, whose salivary glands were examined by Ordonez, who found in their secretion crystalline elements (*élêments cristallins*) never before observed by that able microscopist.

In Schmidt's Jahrbücher, 1859, it is stated that there has been noticed in the latter stages of the disease a considerable augmentation of the white corpuscles of the blood.

† The case of McCormick, just mentioned, has since assumed peculiar interest on account of certain lesions reported by Dr. Wm. A. Hammond as having been discovered by him during a microscopical examination of the nervous centers. These were: Fatty degeneration of nerve cells in the cortical substance of the brain, in the roots of the pneumogastric, hypoglossal, and spinal accessory nerves, and in the upper portion of the spinal cord. Dr. Hammond considers these appearances almost identical with those in two cases examined by Dr. Clifford Allbut and reported to the London Pathological Society in 1872, in which that observer stated that there had been noticed throughout all the cerebro-spinal centers in different degrees, congestion, hæmorrhages, fibrinous exudations, and "little gaps caused by the disappearance of nerve-strands which had passed through the granular disintegration of Clarke." Dr. Hammond regards his own observations as of peculiar "scientific value in determining the pathogeny of hydrophobia." I am unable to agree in his conclusions for the following reasons:

1st. Even admitting (which I do not) that the lesions which he reported were almost identical with those described by Allbut, a number of other equally minute microscopical examinations of the nervous centres and principal nerves implicated have been made in similar cases by experienced observers, *without the detection of any abnormal appearances* in some instances, and only of intense congestion in others. The conclusion, therefore, seems irresistible that the morbid changes noted are not *essential* and *primary* factors in developing the train of symptoms, but are in all probability *secondary lesions*, resulting from the terrible disturbance which the disease causes in the functions of the respiratory, vascular, and nervous systems. Such phenomena could

examination of those who have perished from hydrophobia have proved similarly inconclusive as to the pathogeny and exact character of the disease.*

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hardly, therefore, be of any value in determining the pathogeny of the affection any more than are a thousand and one other morbid changes seen in various organs after death by hydrophobia, and which are well recognized as being merely *consequential and non-uniform lesions*. The eminent German veterinary professor Bollinger, in a recent treatise upon hydrophobia (Ziemssen's Cycl.), does not hesitate to deny emphatically that any post-mortem observations yet made upon either man or beast are of any value whatsoever in tending to elucidate the pathogenic process of hydrophobia. He adds, moreover, that in herbivorous animals especially *there is a complete absence of all characteristic changes*.

2d. Granular and fatty degeneration of the nerve cells are not uncommon pathological appearances in chachectic conditions of the system which do not present any very definite symptoms. Such conditions might therefore *in some cases* precede the development of hydrophobia without, however, exerting more than an *auxiliary* influence in its production.

3d. Very extensive post-mortem researches have been made in cases of rabid dogs without any satisfactory results. I have already alluded to Bruckmüller's investigations. According to Röll, a distinguished German authority, the cadaveric lesions observed in canine rabies offer a certain similarity to those which are the consequence of acute poisoning by narcotic substances. In this connection I may say that upon visiting McCormick two hours before death, he appeared both to Dr. Hamilton and myself laboring decidedly under the narcotism of atropine, of which, as I was then informed by the attending physician, Dr. Hadden, several large doses had been administered.

The most recent pathological investigations of hydrophobic cases fail to throw any farther light upon the question whether the lesions detected in the nervous centers are *pathognomonic* of the disease, or are merely changes such as might be due to tetanus or any other affection producing intense disturbance of the nervous system. Benedikt, of the Vienna Imperial Veterinary School, availing himself of a long-continued epizoöty of rabies in and around Vienna during 1873–4, has made numerous preparations of a number of animals which were affected. The pathological changes were studied by making seven separate vertical sections through the hemispheres; and the alterations were so striking that Benedikt is of opinion they could have been overlooked only through imperfect methods of investigation.

In the first place he notes an abnormal distension of the meningeal vessels, and the accumulation around them and in the meshes of the pia mater of inflammation corpuscles, together with a nucleated exudation. This was strongly refractive of light, was colorless, and under high magnifying powers, was seen to consist of punctiform nuclear substance (granular disintegration). Striking changes were observed in the gray matter of the convolutions and in other parts of the nervous centers. One of the coarser changes was the presence of numerous holes or spaces, which, when magnified 80 or 90 diameters, were seen to be filled with a material which also refracted light. This mass, under high microscopic powers, consisted of a granular or nuclear substance, in which were single hyaloid and colorless corpuscles of the size of the distended nucleus of a blood corpuscle. Inflammatory corpuscles were to be seen in both masses. In the larger spaces nerve-cells were found. Benedikt further describes a peculiar condition of the hardened brain, especially in the finer sections. The slightest pressure forced out upon the surface shining masses which proved to be myelin (colloid?). These were often found lying detached on the surface of the section and presented a greenish lustre. He states, however, that *he has seen the same in the spinal cord of a horse which had suffered from rheumatic tetanus*, and regarded it as a softening and chemical alteration of the cord.

Meynert has also lately made a microscopical examination of the nervous system of two children who died from hydrophobia. The blood-vessels of the spinal cord were distended, and their walls were undergoing amyloid degeneration; and the adventitious tissue of some of them showed nuclear proliferation. A portion of the fibres was surrounded by tumefied resisting medullary substance, which was partially in a state of degeneration, and the cylinder-axis had disappeared. *These alterations were most conspicuous in the lumbar portion of the cord.* The connective-tissue of the posterior portion of the cord was hypertrophied by an excessive enlargement of the stellate bodies. Its vessels were engorged and in a state of partial amyloid degeneration. Molecular and sclerotic changes had taken place in the nerve-cells of the cortical matter. *Meynert considered the spaces or holes observed by Benedikt as a result of the process employed in preparing the specimen for examination.*

* Hallier affirms that he has discovered in the blood of hydrophobic animals a micrococcus, which, when cultivated, is transformed into a cryptogam, to which he gives the name Lyssophyton. I am afraid that this discovery, like others of the indefatigable Hallier, must be accepted *cum grano salis*.

The nature of the subtile rabific virus is likewise unknown, and no chemical or microscopical investigations have yet detected in the slaver of a rabid animal any abnormal constituent. Trolliet maintained that the saliva *per se* possesses no contagious quality—only so when mixed with the frothy material driven out from the bronchi which constitutes the vehicle transmitting the virus. His opinion was founded upon the absence of any evidence of disease in the salivary glands, upon the morbid changes always existing in the bronchi, and upon analogies furnished by other contagious diseases, as gonorrhœa, small-pox, or syphilis. His distinction, however, is of no practical importance. Magendie considered that he had demonstrated the non-inoculability of the disease by any other material of the animal's body than the saliva ; but Hertwig has since apparently proved by experiment that the blood, and therefore most of the tissues, contain, to some extent, the poisonous element. Hence the necessity of careful sanitary supervision over the bodies of all hydrophobic animals. The saliva, as demonstrated by Hertwig, retains its noxious properties for at least 15 hours after death, and it is asserted by Schenck that the disease has been produced by wounds from sabres with which rabid dogs had been dispatched years previously.

It is very important to note the difference between rabies and some other diseases with which it is liable to be confounded.

The affection which most nearly resembles rabies in its manifestations, particularly when it assumes an epizoötic character, is *anthrax*, a special malady which appears in several forms and attacks all creatures, though it would seem to be developed principally and, perhaps, primarily in the herbivora and the pig. In some situations and at certain outbreaks it has presented so many features of similarity to rabies that experienced observers have mistaken the one disease for the other. More especially has this been the case in that variety which has been designated "anthrax fever," "splenic fever," or "typhus" in the horse, which is often attended with such marked symptoms of fury that it has been termed by some German authorities "*anthrax madness*" (milzbrand wuth) ; and several writers, as Van Heim and Adolphi, have even regarded it as identical with rabies. H. d'Arboval says : "We have seen animals in which the anthrax tumors, especially when they formed in the throat, pharynx, or larynx, give rise, some time before death, to symptoms of frenzy and hydrophobia."

Hensinger observes that there is undoubtedly a type of *intermittent fever in man* having some relation to anthrax, in which not only hydrophobia and aphagia, but also at times all the symptoms of rabies are present. This is called "*febris hydrophobica*," and Faber is reminded by it of a similar epidemy which broke out among the German soldiers after the conquest of Rome, A. D. 553. Bollinger alludes to the theory which refers the epizoötic outbreaks of hydrophobia to a peculiar miasma.

On account of the analogies between anthrax and rabies, attempts have been made to establish their closer identity by referring to their localities of origin, anthrax being usually regarded as of malarial source ; but facts have not sustained this theory.

There is no doubt that simultaneous epizoöties of anthrax and rabies have, at various periods, occurred among dogs and other animals in different portions of Europe, and that it has sometimes been exceedingly difficult to distinguish the two diseases. Under ordinary circumstances, however, the differential diagnosis is easy. The appearance of carbuncular tumors and ecchymotic spots, the terrible rapidity of the successive stages, the immediate prostration, the tendency to gangrene, the passage of bloody stools, the yellow hue of the visible mucous membranes—all these are assuredly sufficient to establish the presence of anthrax fever, notwithstanding that other symptoms similar to those of rabies may be present. The pathological appearances, moreover, in anthrax are peculiar and characteristic, while, as we have seen, those of rabies are inconstant and indefinite. After death by the former the animal's body is in a state of immediate putrefaction—the blood is black and thick like pitch—the spleen is enlarged from the presence of enormous tumors—there is infiltration of the mesenteric glands—hæmorrhagic effusions are noticed in the intestinal tube, cellular tissue, serous cavities, and muscular interspaces—the Peyer's plates are generally inflamed and sometimes ulcerated.

According to Lafontaine, in certain countries from the source of the Vistula to the Carpathian mountains, there is a curious disease named the *Plica Polonica*, which attacks dogs, wolves, foxes, sheep, cattle, horses, and human beings. When it seizes upon the canine race they are said to exhibit symptoms closely resembling those of rabies, and are frequently destroyed under the impression that they are mad. They carry the tail between their legs, foam at the mouth,

bite every one whom they meet, even their owners, lose their appetite, appear to be blind, run against walls, and drink more than usual. Their bite, however, has never been known to be followed by hydrophobia. The hair over the body becomes matted from the development of a vegetable parasite.

A very ordinary affection of dogs, often popularly confounded with rabies, is *epilepsy* or "fits." An epileptic fit comes on suddenly without any preliminary indisposition—the animal falls upon the ground, emits cries of distress, struggles violently, loses his consciousness, and often foams at the mouth. His jaws are agitated, but he makes no premeditated attempt to bite. The attack is of brief duration and the animal quickly returns to his normal condition.

Another disorder to which young dogs are subject is called "*puppy fit.*" The creature, who has been perfectly well, suddenly loses his ordinary perception—turns about several times, and if in a room endeavors to escape in an incoherent manner by the door or window; he pays no attention to his master's voice, and if in the open air, he ends by rushing blindly away at full speed, until exhausted he falls down panting and with lolling tongue in some corner or other retreat where he soon entirely recovers from his derangement.

An unfortunate dog, happening to exhibit either of the last mentioned conditions (which, unlike rabies, occur most frequently in summer), is almost certain to be destroyed as a "mad dog," and to receive the customary obituary notice in the daily journals.*

Simple epidemic influenza in its incipient stage has occasionally been mistaken for commencing rabies; but there can be no question as to diagnosis when the former affection has become well established.

The presence of a foreign body in the throat or mouth (as a piece of sharp bone) will sometimes cause a dog to behave in a manner that may lead to a suspicion of hydrophobia. He will refuse food and water, or swallow with difficulty, and become restless and irritable. His voice will change, he will cough constantly, and he will have

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* According to Faber, out of 892 dogs which, between 1826 and 1830, were brought into the Veterinary Institute at Vienna, suspected of being rabid, only 31 proved to be so actually. Prof. Pilwax of the same establishment found in 1862, that out of 552 dogs brought to him for examination, all save 32 proved to be free from the disease. The majority of these animals had bitten people. At that time rabies was epizoötic in Austria. During fourteen years previously, some 5,000 suspected, but non-rabid dogs, who had bitten people, had come under the professor's observation. He remarks, "Not one of the persons so injured by them has had hydrophobia. If the bite of a non-rabid dog is capable of inducing hydrophobia, surely a large number of these people must have been affected and have perished."

abundant salivation. He will continually strive to remove the obstacle with his paws—a very common act with the rabid dog seeking to get rid of the viscid mucus in his throat and mouth. The suddenness of his strange behavior—his evident anxiety to be relieved—the absence of delirium and aggressiveness—are sufficient to indicate the real trouble. The foreign body can usually be seen or felt, and when it is removed the creature immediately ceases his unwonted actions.

It is unnecessary to more than mention various other complaints easily recognizable by experts, but whose initial symptoms may be confounded by the ignorant with those of rabies. These are tetanus —distemper or typhus—fever-worms in the intestines, nostrils, or frontal sinuses—and canker of the ear. In the words of Fleming, "To distinguish rabies from the other maladies and accidental conditions we have just enumerated, the peculiarities exhibited in the course of the disease, and which have been alluded to in detail, ought to be kept in memory; more especially the nervous and mental phenomena—the great anxiety, restlessness, irritability, and hallucinations, even while the animal's mind is as yet but little affected; also the peculiar bark or howl, tendency to rove, depraved appetite, desire to bite—and with a purpose—the subsequent paralytic symptoms, and the difficulty in swallowing."

The question of what precautionary measures against hydrophobia are practicable, efficient, and humane is one of particular interest to city sanitary departments, whose chief province must always be the prevention of disease. How to deal with the canine race, whose intimate relations with man expose him so frequently to rabific infection, is a subject arising annually as the warm season approaches, and is certainly one of peculiar importance to the community. The only precautions hitherto adopted in this city by municipal ordinances*

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* The following regulation exists in London. It forms part of "An Act for regulating the Traffic in the Metropolis, and for making Provision for the greater Security of Persons passing through the Streets, and for other purposes" (20th August, 1867, 30 and 31 Vict., cap. 134): "18. The Police may take possession of any Dog found in any Street within the Metropolis, and not under the Control of any Person, and may detain such Dog until the Owner has claimed the same and paid all Expenses incurred by reason of such Detention. The Commissioner of Police, if he see fit, may issue a Notice requiring any Dog, while in the Streets, and not led by some Person, to be muzzled in such a manner as will admit of the Animal breathing and drinking without Obstruction; and the Police may take possession of any Dog found loose in the Streets without such Muzzle during the Currency of the Order, and may detain such Dog until the Owner has claimed it, has provided a proper Muzzle, and has paid all Expenses connected with such Detention. Where any Dog, taken possession of by the Police, wears a Collar with the Address of any Person inscribed thereon, a Letter, stating the Fact of such Dog having been taken possession of, shall be sent by Post to the Address inscribed on the Collar. The Commissioner of Police may cause any Dog which has remained in the Possession of the Police for Three clear Days

have been the traditional muzzling of dogs and the destruction of canine vagrants. The propriety of the latter measure must be obvious to all. Muzzling, however, is of very questionable utility, being both injurious to the poor brutes upon which it is imposed and without efficiency in protecting the public against the danger intended to be thus averted. It has, nevertheless, become so general a practice in

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without the Owner claiming the same, and paying all Expenses incurred by its Detention, to be sold or destroyed. Any Moneys arising from the Sale of any Dogs, in pursuance of this Section, shall be applied in the Manner in which Penalties under this Act are applicable. When, upon Complaint that any Dog has bitten or attempted to bite any person within the Metropolis, it appears to Magistrates having cognizance of such Complaint that any such Dog ought to be destroyed, the Magistrate may direct the Dog to be destroyed, and any Police Constable may destroy the same accordingly, and all Dogs detained by the Police under this Section, shall be properly fed and maintained."

The New English Dog Act, published on the 24th of July, 1871, and entitled "An Act to Provide Further Protection against Dogs," is applicable to the whole of Great Britain. It is as follows :

"Whereas, It is expedient that further protection should be provided against dogs.

Be it enacted by the Queen's most excellent Majesty, by and with the advice and consent of the Lords, Spiritual and Temporal, and Commons, in this present Parliament assembled, and by the authority of the same, as follows :

1. From and after the passing of this Act any police officer or constable may take possession of any dog that he has reason to suppose to be savage or dangerous, straying on any highway and not under the control of any person, and may detain such dog until the owner has claimed the same and paid all expenses incurred by reason of such detention.

Where the owner of any dog, taken possession of by any constable, is known, a letter, stating the fact of such dog having been taken possession of, shall be sent by post or otherwise to the owner at his usual or last-known place of abode. When any dog, taken in pursuance of this Act, has been detained for three clear days, where the owner is not known, as aforesaid, or for five clear days where he is so known, without the owner claiming the same and paying all expenses incurred by its detention, the chief officer of police of the district in which such dog was found may cause such dog to be sold or destroyed.

Any moneys arising from the sale of any dogs, in pursuance of this section, shall be paid to the account of the local rate, and be applied to the purposes to which that rate is applicable.

All dogs detained under this section shall be properly fed and maintained at the expense of the local rate.

2. Any Court of Summary Jurisdiction may take cognizance of a complaint that a dog is dangerous and not kept under proper control, and if it appears to the Court having cognizance of such complaint that such dog is dangerous, the Court may make an order, in a summary way, directing the dog to be kept by the owner under proper control or destroyed ; and any person failing to comply with such order shall be liable to a penalty not exceeding twenty shillings for every day during which he fails to comply with such order.

3. The local authorities may, if a mad dog, or a dog suspected of being mad, is found within their jurisdiction, make, and when made, vary or revoke, an order placing such restrictions as they think expedient on all dogs not under the control of any person during such period as may be prescribed in such order throughout the whole of their jurisdiction, or such part thereof as may be prescribed in such order.

Any person who acts in contravention of any order made in pursuance of this section shall be liable to a penalty not exceeding twenty shillings

Due notice of such order shall be published at the expense of the local rate.

The provisions of this Act contained as to the detention and sale or destruction of dogs found straying on the highway shall apply to dogs found at large in contravention of any order made in pursuance of this section.

4. In England and Ireland any penalty under this Act may be recovered in manner provided by the Summary Jurisdiction Act, and in Scotland all such penalties shall be prosecuted and recovered before a Court of Summary Jurisdiction, under the provisions of the Summary Jurisdiction Act, 1864."

every country where enactments against injury by dogs have been in vogue, that its usefulness has come to be regarded as an established fact, to deny which is, in the eyes of some, almost criminal. Many of the most distinguished veterinarians, however, men who have enjoyed unusual opportunities for investigating the matter, regard this contrivance as most pernicious and unnecessary. Those who believe in the occasional spontaneous production of rabies consider the muzzle as capable in itself of inducing the disease in the animal to which it is applied. In one portion of this report I have endeavored to prove that the affection is invariably the consequence of inoculation. Such being the case it might seem that the wearing of a muzzle could exert no influence in the production of rabies. Supposing an animal never to have been exposed to contagion, this may be admitted as a fact; but, considering the chances of any dog having been bitten by a rabid animal, without the knowledge of its owner, the question arises in another form. It has been well demonstrated that, in the case either of man or beast thus injured, any serious functional derangement, and particularly impairment of the nervous system, is directly instrumental in disturbing and liberating the rabific virus from its local tissue-union in the cicatrix, when, under ordinary conditions of health, the period of incubation might have been indefinitely prolonged. Now, it cannot be denied that every muzzle more or less embarrasses the respiratory function and buccal transpiration of the creature wearing it, and creates frequently a condition of great nervous disorder in an animal of such peculiarly excitable temperament as the dog. I have no doubt, therefore, that its use sometimes leads indirectly to the development of rabies, and thus renders dangerous an otherwise inoffensive brute.

The affection, moreover, is not one which, like the canine epileptic attack, appears suddenly and unexpectedly. A dog in the premonitory stage of constant restlessness, snappishness, and disinclination for human society, presents conditions inconsistent with his owner's taking him into the streets, which conditions naturally become more marked as the disease advances. When at home, he is almost always unmuzzled, and if rabid, is dangerous only to his companions. He soon, however, is seized with a propensity to escape from home, under which circumstances he is not apt, although so intelligent a creature, to present himself for muzzling as a preliminary to his elopement.

The chief evidence in favor of the muzzle is that brought forward

from the experience of its use in Berlin. From 1845 to 1853 there were reported in that city 278 cases of canine rabies. From March, 1852, to the same month in 1853, there were sent to the Berlin Veterinary School 82 mad dogs, and by the end of July 37 more. On the 20th of July it was ordained that muzzling should become general, and up to the close of the year only 6 cases were admitted into the Veterinary School. In 1854 and 1855 the number was but 1, and from that time up to 1863 there were no cases. These figures were supposed to establish the utility of the practice, but during the next year (1864), and up to the middle of 1865, some 30 cases occurred, in spite of the fact that all dogs in the city were wearing muzzles.

According to Prof. Lafosse of the Veterinary School at Toulouse, France, a city where the use of the muzzle is not obligatory, years frequently elapse without any cases of rabies being there noticed. The veterinary authorities of Brussels, in an excellent report on rabies, drawn up in 1868, when the disease was creating some alarm in Belgium, were forced from their experience to disagree with the Berlin authorities as to the value of the muzzle either in preventing rabies or protecting human life.

There is a special absurdity, likewise, in the policy of relaxing municipal surveillance over dogs during three quarters of the year, and maintaining it stringently in only the summer months, when, as Mayo has observed, the dog is popularly supposed to be subject to a species of lunacy having the same relation to Sirius that human insanity has to the moon. This opinion can be respected only on account of its antiquity.

The means at our disposal for protecting the public against injury by dogs have for their principal object to diminish the number of worthless and vagrant curs. This decrease may be accomplished by the taxation of all dogs having owners, and the destruction of all having none. The measure of taxation has been shown in several European countries to be very efficacious in ridding the community of a vast number* of useless and dangerous brutes, but to be really efficient the tax should be general and high, particularly in the case of pleasure and sporting dogs.

Every dog, moreover, should be obliged to wear a collar with a

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* Boudin has estimated the number of dogs in Europe as more than twelve millions, and the price of their food as at least five hundred millions of francs. Delafond estimated the number in France in 1846 at from three to four millions. In Bavaria there are 300,000 dogs to 4,800,000 human beings.

metal plate bearing the name and address of its owner, as well as some peculiar mark or badge issued by the municipality to indicate that the tax has been paid.* In case such a tax were authorized by the Legislature, the Boards of Health might be empowered to grant permits for keeping dogs under the conditions specified.

At Strasbourg, France, before the late war, there prevailed an excellent system of this kind. Every person possessing a dog was required to notify the police, who furnished him with a license, duly numbered and registered. The same number, with the owner's name and address, were inscribed on the animal's collar. A covered conveyance with compartments was constantly patroling the city in order to pick up all wandering dogs, which were taken to a building permanently devoted to the purpose. They were kept there for three days, and if then unclaimed were destroyed. During this period an owner might reclaim his dog upon payment of fifteen francs. The result of this system was extremely satisfactory, as hydrophobia became almost unknown.

The collar is also useful in case of any damage inflicted by dogs. The French Civil Code ordains that "the proprietor of any animal, or he who employs it, is responsible while it is in his employment for any damage it may cause while in his charge, or when straying or escaped."

At a recent meeting of the French Academy of Science there was presented a memoir by M. Bourrel on a new method of protection against rabies. M. Bourrel proposes as a preventive measure, taking off the edge and points of the twelve permanent incisors and four canine teeth by means of nippers and files. He asserts and has proved by experiment that this operation renders the dog virtually incapable of inflicting wounds on men or animals; there is no subsequent derangement of health; the creature eats and digests as well as before; the teeth are no more exposed to caries than they would be naturally; the lips conceal them, and the dog's beauty is unimpaired. In the case of home and pet dogs this operation might be recom-

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* Such a distinctive badge is used in Holland. Max Du Camp states: "At Harlingen, in Friesland, I saw a dog pass which had a wooden cross hanging at its neck; then a second dog and a third; and finally I observed that every dog in the town was decorated with a similar ornament. Making inquiry respecting this matter, I was informed that all dogs not wearing the cross were, in the canton of Harlingen, immediately apprehended and led by the ears to the pound; for the crosses are issued by the municipality, and their possession proves that the tax imposed upon such animals has been paid."—*En Hollande*, Paris, 1859.

mended as a useful measure. I may allude briefly to some of the more obvious precautions against hydrophobia.

A dog manifesting any morbid or unusual symptoms should be carefully observed,* kept apart from other animals and from human beings, children particularly, and the utmost care should be exercised in attending to and feeding it. A dog evincing constant restlessness, an altered or threatening demeanor, snappishness, depraved appetite, a modified bark, and salivation, should demand extraordinary vigilance. If a person has been bitten by an animal with unquestionable symptoms of rabies, it should be destroyed at once ; but if wounded by one merely conjectured to have the disease, it is advisable *not to kill it immediately, but to confine it closely under strict surveillance until the suspicions shall be allayed or positively confirmed.* Such a measure will occupy but a few days and may save from much apprehension persons of very nervous excitability. As it is usually difficult and dangerous to attempt the precautions mentioned in one's own home, the establishment of well-regulated dog infirmaries in all cities is very desirable. In such places, moreover, valuable and esteemed animals suspected of the disease, or which may have been in contact with rabid dogs, can be readily kept under observation for a period sufficiently long to insure almost complete safety. This sequestration should extend to *six months at least.*

All animals bitten by dogs supposed to be mad should as quickly as possible receive those attentions which are recognized as most effectual in destroying the rabific virus, or preventing its absorption. Mr. Youatt, the very best authority upon this subject, relied exclu-

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* The Austrian Penal Code (387) says : "Whoever knows of a dog or any other animal showing the distinctive symptoms, or symptoms which warrant suspicion, of rabies, and who neglects to report the same to the police, is guilty of infraction of the law and liable to imprisonment. In case of the appearance of the disease and the biting of men or of animals, the culprit shall be punished with from three days to three months' imprisonment (*carcere duro*). If a serious wound or the death of a human being has been the consequence of this negligence, the infraction shall come under the application of 335, which says : 'He who shall be guilty of this negligence shall be punished with from one to six months' imprisonment, if its consequence has been a serious wound ; if the death of a man has been the consequence, the penalty is from six months to a year's close imprisonment. Otherwise, the proprietor is always responsible for the damage caused by mad animals.' "

The same Code (391) says : "Every owner of an animal, no matter to what species it may belong, which he knows to be vicious, ought, in or out of doors, to watch and take care of it, so that it may not wound any one. Any damage caused by the neglect of this precaution is punishable by a fine of from five to twenty-five florins, if there has been no wound inflicted ; but when this is the case, the penalty may be increased to from ten to fifty florins."

The French Civil Code ordains that "the proprietor of an animal, or he who employs it, while it is in his employment, is responsible for the damage that it causes, either while in his charge or when it is straying or escaped."

sively upon a thorough cauterization of the wound with nitrate of silver. With this simple treatment he was successful in over 400 instances in the human subject, and in innumerable cases of dogs; in his own person, moreover, as he was frequently bitten by rabid dogs, and once severely by a mad cat.

Finally, all rabid animals, after death, should be covered with quicklime, and buried at a good depth below the surface of the ground, or, better still, should undergo cremation. They should never, as is frequently done, be thrown into ditches, ponds or streams. Every substance which they have been likely to contaminate should be consigned to the flames or soaked in some powerful disinfectant.

Respectfully submitted,

CHAS. P. RUSSEL, M. D.,
Sanitary Inspector.